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PRIMITIVE MEDICINE AND CULTURE PATTERN

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"Medicine is a social institution. It comprises a set of beliefs and practices which only become possible when held and carried out by members of an organized society, among whom a high degree of the division of labour and specialisation of the social function has come into being. Any principles and methods found to be of value in the study of social institutions in general cannot be ignored by the historian of medicine."

—W. H. R. RIVERS

Literature on primitive [1] medicine generally consists of two types of writings: monographs ("The medical customs of the . . . in . . .") or general treatises ("The medicine of uncivilized peoples," "Primitive Obstetrics," etc.). In the latter a maximum of unrelated facts from the different monographs or general ethnographical literature is collected and thus a kind of anthropological "Frankenstein," as Ruth Benedict [2] terms it, is constructed. Things do not seem to

* I want also to express here my sincere gratitude to Miss Genevieve Miller who corrected this as all my other papers so far published in English.

[1] We remind our reader again that we use the somewhat problematic term "primitive" exclusively to characterize the preliterate peoples of the world without implying in the least that these peoples represent either evolutionary stages of our civilization or a well defined conceptual unit opposed to all "civilization," etc. See also our article: Problems of Primitive Medicine, *Bull. Hist. Med.*, vol. XI, No. 5, p. 503.

[2] Ruth Benedict: *Patterns of Culture*, New York, 1934, p. 29.

improve very much by pressing these poor, isolated facts in the mould of an at least extremely hypothetical, evolutionary scheme. The results are generally a highly unreal picture of primitive medicine and the somewhat faulty approach explains a good many of the numerous errors still prevailing in our field.

It has now been almost generally recognized that the significant unit in cultural anthropology is the single culture, the cultural configuration or "culture pattern" of the respective tribe (or group of tribes) and not the single institution.[2a] In other words: the "organism" and not the "organ." It is this pattern which gives its special value, character, flavour and colour to the single trait. It is neither the mechanical addition of laws, arts, techniques, religions, etc. which makes the cultures, nor does a mere summation of data concerning all laws or all religions or all techniques of preliterate tribes help us to understand these institiutions or the cultures in which they are inserted. The institutional elements of human culture are relatively few and limited as are the colours and subjects of the painter. But the possibilities of arranging, selecting and combining these elements, of accentuating them differently, are almost as unlimited as are the possibilities of the painter to mix and distribute his colours and subjects.[3] Little understanding of painting would be gained by merely enumerating the different colours and subjects used by the painters from the 14th to the 20th century all over the world. It is by comparing the pictures and their history that we proceed to an understanding of painting.

Medicine like other institutions is not an exception to these rules. It is an almost hopeless task to try to understand and evaluate the medicine of one primitive tribe while disregarding its cultural background or to explain the general phenomenon of primitive medicine by purely enumerating that in the medical field primitives use spells,

[2a] "The series of social phenomena are solidary with respect to each other, and they are placed in mutual relationship," L. Lévy-Bruhl, *Les fonctions mentales dans les sociétés inférieures, English transl.*, p. 27.

[3] The Sun Dance e. g. is executed exactly the same way by the Cheyenne as by the Arapaho and in a very similiar way by 20 other Plains tribes; but it always has a different meaning (L. Spier: The Sun Dance of the Plains Indians, *Anthrop. Papers Am. Mus. Nat. Hist.*, XIV, 1921, pp. 451-527). The same rites among the Navahos have a healing purpose; among the Hopis they produce fertility of the fields (R. H. Lowie: *Primitive Religion*, New York, p. 294).

prayer, blood-letting, drugs, medicine men, twins, toads, human fat and spittle, etc. For instance the statement "All forms of ancient and primitive medicine are identical" (Garrison) may perhaps be correct, but it is certainly rather meaningless. It ends where the problem begins. What counts are not the forms, but the place medicine occupies in the life of a tribe or people, the spirit which pervades its practice, the way in which it merges with other traits from different fields of experience.

It is certainly more than pure chance that the emphasizing of the configuration in anthropology, opposed to a continued analysis of the parts, coincides with similar trends in biology, psychology, philosophy, etc. On the other hand "the culture pattern" conception is no arbitrary invention or mechanical imitation, but has genuinely grown out of the patient and unprejudiced labor especially of American anthropologists first defining American culture areas, out of the work of Franz Boas and Goldenweiser, Kroeber, Lowie, Sapir, Wissler, etc., and of the English functionalists. It eventually has been formulated in a rather special and most radical way by Ruth Benedict.[4] Convinced of the correctness and the utility of this conception, nay, of the necessity to introduce more modern and adequate methods into the study of primitive medicine, we have written as a first attempt[5] the following three sketches of the culture pattern and "medicine" of the North American Cheyennes, the Melanesian Dobus and the South East African Thongas; limited of course by the space at our disposal and the material available. This attempt by no means closes the door to generalizations. Only before generalizing it would perhaps be useful

[4] "Mourning or marriage or puberty rites or economics are not special items of human behaviour, each with their own generic drives and motivations which have determined their past history and will determine their future but certain occasions *which any society may size to express its important cultural intentions.* The significant sociological unit from this point of view, therefore is not the institution but the cultural configuration," Benedict, *l. c.*, p. 244.

[5] The series of A. W. Nieuwenhuis, Die Anfänge der Medizin unter den niedrigst entwickelten Völkern, *Janus* 1924, 1925, 1926, unfortunately serves mostly to prove Prof. Nieuwenhuis' highly controversial thesis: "how much even these least cultivated peoples were governed by intellect in a narrower sense in their behaviour to environment" and is not very familiar with "functionalist" techniques of description.

to reexamine with what exactly we are dealing, and to realize how different things really are which generally are united under the one label: Primitive Medicine. Generalizing will then probably be more difficult but we hope, on the other hand, more scientific—generalizations being obtained by abstraction and not by summation—and more correct.

Cheyennes [6]

The Cheyennes are a typical Plains tribe.[7] Warfare is the activity in which they feel most strongly the pulse of life, its value and its beauty. Of course it is their kind of "war," very different from ours; the war of little groups—war parties—almost the war of individuals, very seldom involving the whole band, much less the whole tribe. Sometimes one announces his way of life clearest by his way of death. "The Cheyenne warrior wishes to be killed, if at all, on the broad level prairie where everyone can see him. When he dies he does not wish to be covered by earth, but prefers to lie out on the prairie where the birds and animals may devour his body and his remains may be scattered far and wide."

Of course one generally cannot make a living out of war and so the first concern of the Cheyennes is food gathering. This is done mostly by the men who hunt the buffalo, antelope, etc., a hard and strenuous occupation. The buffalo is their basic food and forms their basic clothing and housing material. Thus their migrations are

[6] Except when other references are given the facts concerning the Cheyennes are taken from the writings of J. B. Grinnell, especially his book, *The Cheyenne Indians*, 2 vols., New Haven, 1923. We use the present tense although the period of flourishing of the customs described dates back about 90 years, when the Cheyennes were still free. They are now living in reservations in Oklahoma and Montana.

[7] It is a hard blow to our general belief in primitive conservatism to learn that the Cheyennes, "in many ways the most conservative of the tribes of the plains" (Dorsey), because a typical Plains tribe only in historical times; they migrated during the 18th century from the Great Lakes where they had been sedentary, farming, fishing and hunting small game with stones, clubs and pits. Not only the gun and the horse, the "gifts" of the white man, but also such fundamental and typical traits as the use of dogs, bow and arrow, the movable tipi, even scalping and warfare seem relatively recent acquisitions. Outstanding traits of the past on the other hand, like farming, matrilineal descent, etc., seem entirely forgotten. The cholera epidemic of 1849 which killed half of the tribe may have contributed to the latter fact.

conditioned by the wanderings of the herd. Supernaturally endowed persons ("medicine men" who however are neither professionals nor healers) and magico-religious ceremonial (sacrifices, smoking) play a big role in their hunting. Hunting is controlled by the chiefs and the warrior societies and cannot be undertaken regardless of the community. The men make their implements; the boys herd the horses. The women gather all kinds of roots and the fire wood, carry the water, light fires, prepare the hides, make clothing, tipis and cooking utensils. In spite of a very rigorous division of labor between the two sexes, and in spite of polygamy (a man generally marries sisters) the position of women is high. The man and the woman are partners, sharing equally in the work of the family. Women have personal property of their own (horses). They have their own societies for ceremonially quilling robes and lodges. Sex-life is very much restricted. Courtship goes on for 5 and 6 years. Chastity of the girl is required. Her protective string is respected by everybody. There are few love charms. Parents who have children at long intervals are praised. The general bearing of these customs seems less than would be expected. The Arapaho build up similar characters with great looseness of their women.

Cheyenne warfare started probably with the prosaic step from hunting of wild horses to mere horse stealing. But passing over the motivations of revenge and desire for glory, it crystallized into pure love of fighting. From the beginning the boy is taught that his chief duty in life is to be brave and to go to war and fight. After his first war party he gets a new name. Only when he dies in war can the Cheyenne expect to get his full share of the short but exalted bloody mourning ceremonial, when his best horse will be killed and his wives will cut their hair, cut off joints of their fingers and gash their legs severely. When he dies without "counting a coup" on the enemy his war party will return silently, almost ashamed. But when he dies as a brave, they will return shouting triumphantly, their faces painted black, as if no one had died. Only war deeds are real life and count more than death.

Warfare is naturally connected with one of the fundamental spiritual elements of Plains culture: self torture to obtain a vision-dream which possibly procures a guardian spirit and indicates a war

"medicine." But with the Cheyennes the accent is rather on the *self torture as a sacrifice* (fasting and thirsting, swinging from a pole with the ropes fixed in the skin, wearing buffalo skulls by the same technique) than on the dream. Of course visions or dreams are highly desirable and appreciated. But the mere torture alone may already bring power and success on the warpath. On the other hand torture may be undergone after a dream, or success, or avoiding a danger, as fulfillment of a vow or expression of gratitude to the spirits. It may be done during the Medicine Lodge ceremony or at other times, publicly or in isolation. It is interesting that besides the vision another method of divination on the warpath exists: seeing the future in the blood of the badger. Other ways of getting supernatural power in the warpath are the use of shields, lances, warbonnets, scalp shirts. These objects are manufactured by visionaries and initiated with much ceremony involving the eating of the dead enemy's heart. They are connected with so many taboos that their use is restricted to a few men. Everybody wears charms and amulets which are seldom destined to protect against disease or to further love, as in other tribes, but are used to protect in war. The terrible necklace of High Wolf composed of human fingers and the small buckskin bag filled with right hands of Shoshoni papooses, captured by Bourke in 1876, are probably also such charms.[8]

The leader of the war-party, carrying a special pipe, is supposed to have special supernatural power and protection. But neither is he a priest or medicine man, nor has the medicine man who generally accompanies the war-party—very often one of the strange man-woman (man in woman's clothes)—other rights than the duties of a healer and joke-maker. He is by no means the leader as for instance he is with the Cherokees.[9]

While spiritual beliefs penetrate Cheyenne war-lore, war-lore and its outstanding symbol "counting a coup" (more exactly the recitation of a brave on how he "counted a coup") pervades the whole spiritual, social and practical life of the Cheyenne. Neither killing nor scalping the enemy is so important as counting a coup, that is,

[8] Bourke, J. B., The Medicine Men of the Apache, *Bur. Am. Ethn. Rep. IX*, p. 481.

[9] Olbrechts, F. and Mooney, J., The Swimmer Manuscr., *Bur. Am. Ethn. Bull.*, XCIX, p. 91.

touching him. The Cheyenne does not doubt that a man taking a false oath for having counted a coup will certainly die. A man counting a coup is necessary for the "baptism" ceremony of the Cheyenne baby: the piercing of the ears, a magical rite the meaning of which has become obsolete. Here the Cheyenne show another important trait of their culture; generosity in order to earn social recognition. The man who pierces the ears is not paid following a fixed "tariff," but he gets as many horses as the family can afford. Also the first hunting success of the Cheyenne boy is celebrated by giving away horses and meat. Counting a coup is necessary in the preparing of the holy white buffalo hide, in the fabrication of the scalp shirt. Counting a coup is necessary in sanctifying the dipper of the war-party. Counting a coup is needed for the initiation of every lodge, not to speak of the big ceremonials. A competition of coup-counters is one of the biggest social games. Even the ceremonial of the women's society includes the counting of coups. The women also play war games with the men, returning from root and wood gathering. Sometimes women successfully participate in war-parties and form their own "veteran" society. While the Zuñi for instance suppress strong personalities and individuality,[10] the Cheyennes, especially by this custom of coup counting and the individual approach to the spirits in torture and vision, breed them.

That does not mean that there is so much aggressiveness and anarchy as in other individualistic societies. From early youth the Cheyenne is taught to be on good terms with his fellows. A spirit of helpfulness and kindness reigns among them. There is practical community in food. Theft is unknown. A very loose democratic organization is sufficient to keep order. In the circle of lodges of the band the Indian lives his whole life long in public and submits to the community. The qualities required of a chief are very characteristic: he must be brave in battle, generous in disposition, liberal in temper, deliberate and of good judgment. He is not a priest. His first duty is to take care of the widows and orphans, his second to make peace in the camp. His dignity does not permit him to take part in any quarrel. He even cannot avenge the abduction of a wife. There are 44 chiefs: 4 principal chiefs and 4 for each of the 10 bands.

[10] Benedict, *l. c.*, p. 99.

Their councils are conducted with much form and courtesy. The crier makes public the decisions throughout the camp. A great role in the public life as police force, pressure group, dancers in the big ceremonials, is played by the seven warrior societies or soldier bands. The man who kills a fellow tribesman receives his corporal punishment from the relatives of the slain, not from the tribe, but he is an outlaw for the whole tribe. Nobody will smoke or eat with the murderer. He is supposed to decay inwardly. He is in an extreme state of nervousness. His crime is regarded so grave a menace for the whole tribe that in a solemn ceremony the holy arrows, the " ark of the covenant " of the Cheyenne have to be renewed.

The Cheyennes are a religious people and devoted to numerous supernatural agencies: there is the spirit of the heavens, the highest god; there is the spirit of the earth; there are the spirits of the four directions, while the spirits of the dead are of little importance. Animals interfere very much in their material as well as in their spiritual life. Many people even understand the language of the animals. The wolves give advice in war, the white tailed deer helps in love affairs. The mule-deer and the elk bring illness, and the bear heals. Birds and insects show the way to the game. Their religion is of the " Winnebago " (making oneself pitiable before one's gods), and not of the " Zuñi " (making oneself happy) type.[11] There are no real professional priests. There are individuals supernaturally more endowed and who, having assisted in former ceremonies, instruct others. The Cheyennes do not, like the Navahos,[12] spend one-fourth to one-third of their productive hours in religious activities, big ceremonies, but *their whole life is full of little ceremonial acts.* Before every meal they pray and sacrifice, also before lighting a pipe. *Pipe smoking*, probably first used in rain magic, is a highly ritualized act and next to coup counting the most used in ceremonial gesture. They smoke after killing game; they smoke in the war-path and when asking for participation in the war-party or the Sun Dance, when seeking instruction in self torture or doctoring. The offering of the pipe is the general ceremonial way of asking an important

[11] Aitken, B., Temperament in Native American Religion, *Journal Anthr. Inst.*, LX, 1930, p. 371.

[12] Leighton, A. H. and D. C., Elements of Psychotherapy in Navaho Religion, *Psychiatry*, IV, p. 518.

favor. There are also taboos: the taboos of the menstruating woman, of the sister, of the mother-in-law, of the shield, scalp shirt and war bonnet, of tanning wolf skins, etc. Fortunately some of them can be removed by special ceremonies. Ceremonial is the whole behaviour of the war-party, the return of the scout, etc. The Sweat Lodge is mostly a magico-religious enterprise, not purely " practical " as with the Cherokee.[13]

The Cheyenne were formed by fusion of two tribes, the Cheyenne proper and the Suhtai. Consequently they have two culture heroes: Sweet Medicine and Standing-on-the-Ground; two holy objects: the medicine arrows and the buffalo hat; and two big ceremonies: the " renewing of the arrows " and the " Medicine Lodge " (Sun dance). Mooney [14] and Dorsey [15] mention only these two big ceremonials. Grinnell describes a third one, the Massaum ceremony. Although celebrated almost annually by the whole tribe, these ceremonies are not regular calendar holidays like our Christmas, Easter, etc., but each time they arise from the personal vow of a single man who with his wife are then the central figures of the ceremony. The holy " Medicine Lodge " is created for the benefit of the people and a good harvest. Prayers and sacrifices are offered to the mountains, buttes, hills, animals, birds, timber, grasses, fruits, " medicines," and waters. During 4 days there is much smoking, fasting, painting, coup counting, dancing in the lodge, where an altar around a buffalo skull is built. The " renewing of the arrows " is done to insure the health of the people, the abundance of buffalo, cherries, berries, roots, grass and all animals. The Massaum ceremony has the same elements as the Medicine Lodge. It is the feast of the earth. Prayers are spoken for health, long life, good living, kindly feeling toward each other. The buffalos, wolves, foxes, coyotes, the white tailed deer appear as dancers at this ceremony of hunters. The elk practices healing acts as do the members of the " Contrary Society." These religious gatherings have also a highly social character. Besides there is a lot of sportive competition and games among the Cheyennes, feasts with story telling and other amusements. The scalp-dance after the

[13] Mooney, J., The Sacred Formulas of the Cherokee, *Bur. Am. Ethn. Rep. VII*, 1885-1886, p. 333.

[14] Mooney, J., The Cheyenne Indians, *Mem. Am. Anthr. Ass.*, I, 357-442, 1907.

[15] Dorsey, G. A., The Cheyenne, *Field Mus. Anthr. Ser. IX*, 1-186, 1905.

return of the warriors is an outspoken love-dance—love comes out of war in Cheyenne society.

But where does medicine enter the picture? Perhaps the most characteristic feature of Cheyenne medicine is that one could speak so largely of Cheyenne life and beliefs almost without mentioning disease and medicine. (We speak, of course, of medicine in the original sense. One of the great difficulties of the study of Indian lore is the universal use of the word "medicine" when clearer conceptions are lacking, and the expression comprises magic, custom, personality, god, etc. as well.) That would have been impossible with the Cherokees where "the chief necessity for religion in fact is found in the existence of disease and the principal office is its eradication," [16] or with the Navahos where the majority of the 35 principal ceremonies are concerned with disease,[17] or with the poor Yavapeis who for their preoccupation with health and sex receive the label of "degenerates" by Mrs. Aitken.[18] The difference between the Cheyennes and the other tribes seems primarily not objectively conditioned. Judging from their drugs for coughing, belly-ache, dysmenorrhoea, head-ache, hemoptysis, rheumatism, baby ailments, fever, sore throat, kidney troubles, paralysis, poison ivy, carbuncle, disease seems not altogether unknown to them. Of course death in war is still much more likely than death because of disease. The Cheyennes are fatalistic in regard to disease. Already their culture hero, Stand-on-the-Ground, says that disease cannot be avoided. The Cheyenne way for the man without hope of recovery is to look for death in battle. (Sometimes, incidentally, the hero survives—and recovers.) The Cheyenne fixes his objective fears and unrest on other symbols. The anxiety for food for instance pervades the whole Cheyenne religion, a problem which the Navaho underestimates.[19] The Cheyenne have no possessed persons. But some of the bravest warriors suffer, especially in their old age, from such a terrible fear of lightning that for their protection they become "contraries," that

[16] L. Spence, *Hastings Encycl. Rel. Eth.*, vol. 3, p. 505.

[17] Leighton, *l. c.*, p. 517.

[18] Aitken, *l. c.*, p. 370.

[19] Leighton, A. H. and D. C., Some types of uneasiness and fear in a Navaho community, *Am. Anthr.*, vol. 44, No. 2, 1942, pp. 194-209.

is, enter a most burdensome social position where they always have to say and do the contrary of the normal.

The Cheyennes have of course a kind of medicine. Relatively few protective measures are practiced however. Disease is caused by invisible arrows shot by the spirits of wells, the mule-deer and other spirits. Very seldom are taboo-breaking or witchcraft considered responsible for the disease. The treatment is composed of the " small ceremonial " typical for the Cheyennes. Grinnell lists a typical treatment as follows: purifying of medicine man and patient, singing (and rattling), smoking a holy pipe, purifying, application of a drug, singing, suction, application of a tea, smoking, purifying, singing, gentle massage, singing, smoking, sacrifice, eating. The doctoring songs are unusually short and simple—" I know myself, I possess spiritual power." The words are repeated over and over again. Some songs even have no words. The pipe is of course of great importance. The drugs are staples with other magical objects. Grinnell lists 94 medicinal plants, a great part of which are effective. The sucking procedure produces small stones, buffalo hairs or lizards.[20] Sometimes women cut joints off their fingers in sacrifice for the recovery of a sick husband or child. Against epidemics they know no other help than fleeing. A very few men treat the bite of a rattlesnake in a way that seems mostly magical. Surgery is almost unknown, but the recuperative powers of the American Indian from wounds seem extraordinary and seem to be the basis of numerous Cheyenne " miracle " stories of reviving the dead. To become a medicine man of the healing kind one must have a dream. But then he learns the lore and the special language, from an elder medicine man. It is very significant of the deep rooted solidarity between the sexes that his wife has then also to become a healer. Except those who are half men, half women, the medicine men limit their activity to healing. Men doctors are also horse doctors.

When we analyse the Cheyenne medicine we miss some elements familiar in other primitive tribes; we find numerous others, but they are accentuated and arranged differently. That seems to be the

[20] The sucking procedure is not necessarily supposed to produce objects as is proven by the behavior of the Bakairi, Victoria Australians, etc. Its symbolical meaning can also be attained by removing an immaterial disease principle. See Ackerknecht, *l. c.*, 509 ff.

consequence of the fact that the Cheyennes adopted a lot from their neighbors, but integrated it more or less into their own pattern. As a whole Cheyenne medicine is extremely poor in esthetic elements, so strong in the Navaho sand-paintings or the Zuñi dances. Among the causes of disease the object-intrusion idea dominates. The soul-loss conception is entirely absent. Witchcraft belief is weak compared to the Cherokees' [21] probably because of the mutual loyalty among the Cheyennes. The taboo-breaker is menaced by other dangers (failure in war and hunting) rather than by illness. The dream as *cause* of disease, well known in Navaho and Cherokee lore, seems equally absent. Herb knowledge is not surprising in a tribe of root gatherers: it is generally strong among the American Indians.[22] The Cheyenne medicine man is rather different from most of the Indian healers. He is more a man with a special spiritual power and some knowledge, addicted to healing, than a "medicine man." He has not a fantastic costume like the Haida shaman.[23] There is not the differentiation between the lay healer-herbalist and the supernatural medicine man as for instance among the Dakota, Navaho, Apache,[24] Crow [25] or Ojibwa [26] tribes. His power is not hereditary as with the Omahas and Hidatsa: [27] there is no formal initiation. He has not the enormous knowledge of the Cherokee or Navaho medicine man, nor is he a leader or a priest like both of these.[28] In a tribe abounding with societies there is no medicine men society, neither of the Ojibwa [29] nor of the Pawnee [30] nor of the Omaha,[31] nor of the Zuñi [32] type.

[21] Mooney, J., The Myths of the Cherokee, *Bur. Am. Ethn. Rep. XIX*, 3-548, 1898.

[22] Stone, E., *Medicine among the American Indians*, New York, 1932.

[23] Corlett, W. Th., *The Medicine Man of the Amer. Indian*, Springfield-Baltimore, 1935, p. 92.

[24] Hrdlicka, A., *Bur. Am. Ethn. Bull. XXX*, vol. I, p. 838, 1907.

[25] Corlett, *l. c.*, p. 116.

[26] *Ibid.*, p. 123.

[27] *Ibid.*, p. 121.

[28] Olbrechts, *l. c.*, p. 83 and 92.

[29] Hoffmann, W. J., The Midewin or Grand Medicine Society of the Ojibwa, *Bur. Am. Ethn. Rep. VII*, p. 164, 1891.

[30] Linton, R., Annual Ceremony of the Pawnee Medicine Men, *Field Mus. Leaflet No. 8*, 1925.

[31] La Flesche, F., The Omaha Buffalo Medicine Men, *Am. J. Folklore*, vol. III, p. 215, 1890.

[32] Benedict, *l. c.*, p. 104.

When we regard the Cheyenne culture pattern, it seems to us quite definite in its relation to war, ceremonial, vision and sacrifice, social relations, etc. although we cannot condense it in a catchword. Examining medicine in this pattern we find medicine pervaded by many of its typical traits: the rather democratic position of the medicine man, the limited role of dreams, witchcraft, taboo, protective measures, the arbitrary way in which disease is distributed by the supernaturals, the role of the pipe and other ceremonials, the sacrifice, the role of women, the relation to animals and plants. But we find also elements not directly connected with this pattern and we miss some of its most typical elements so that the relative neglect of medicine is perhaps the most Cheyenne-like trait of Cheyenne medicine.

Dobuans [88]

The Dobuans are "Massims," that is, Eastern Papuo-Melanesians, living on small volcanic islands of the D'Entrecasteaux group, north of Eastern New Guinea. Although they do some fishing, sometimes kill a pig, have some sago and banana trees, coconut and betel palms, the very basis of their rather poor diet is their yams. Thus the yam garden is economically the most important place in Dobu. The future son-in-law and daughter-in-law have first to show their abilities in these places before they are admitted into the family. For them and their brothers and sisters it is also a place of humiliation as they must not only work hard but also must fast since they cannot eat in the presence of their future parents-in-law. Just as in Dobu no results whatever (in fishing, exchanging, love-making, etc.) can be obtained without incantations, the garden is also an important place of ritual throughout the year. Yams are human beings in metamorphosed form and have to be continually charmed in order to grow and multiply. Yam seeds are, as everything else, hereditary only in the maternal line (from mother's brother to nephew) and so are the incantations which can only make that special kind of seed grow. That is why man and wife, although working together, both have a garden of their own for their respective seeds and incantations. In these conditions incantations are the greatest wealth and are

[88] Except when other references are given, the facts concerning the Dobuans are taken from the study of R. F. Fortune: *Sorcerers of Dobu*, New York, 1932.

given from one person only to one of the children in recognition of services rendered to the elder. The spectacle of 40 years of successful Mission gardening without incantations has not made the least impression on Dobuan belief.

The Dobuans murmur their charms unlike their neighbors, the Trobriands, who pronounce them loudly. The Dobuans believe that every success in the garden as everywhere is not so much a magical victory over the forces of nature, as a victory over one's neighbor. Yams wander at night and when you have a better crop it is because by your stronger magic, by special yam-alienating charms, you have attracted and stolen a part of your neighbor's yams. Thus a better crop is an offense to your neighbors and they will try to take revenge by employing against you their disease spells. Under these circumstances incantations have to be kept in the strictest secrecy. The clearing of the fields is done in common, but afterwards the presence of strangers in the garden is strongly resented. In the incantations an archaic, esoteric language is employed. The spell is uttered over a magical herb or plant and always the intervention of a supernatural, a legendary spirit is invoked. As magical plants the Dobuans often employ cordylina terminalis which is used all over Oceania for different magical purposes (healing, calming the spirits of the dead, ceremonial of ghost societies, fire walking, etc.).

A leaf on a palm tree warns that a "taboo," a spell for causing diseases, has been placed on the tree trunk. That is quite a common measure in Melanesia.[84] Every man or woman in Dobu knows from one to five of such incantations and of course respective incantations to heal the disease caused by the taboo: otherwise he could not approach his own tree. In the charm an animal is generally mentioned which both makes the disease and which gives the name to it. The charm is uttered again into an object (leaf, creeper). As every disease is held to be caused by a taboo, a list of the taboos gives also a certain idea of Dobu pathology. There are spells for cerebral malaria (associated with the white-headed osprey), inflammation of gums (paper wasp), intestinal trouble (shark), toothache (in-

[84] Codrington, R. H., *The Melanesians*, Oxford, 1891, p. 217; Rivers, W. H. R., *Magic, Medicine, Religion*, London, 1924, p. 33; Hocart, A. M., Medicine and Witchcraft in Eddystone of the Solomons, *J. R. Anthr. Inst.* 1925, p. 262; Malinowski, B., *Argonauts of the Western Pacific*, London, 1922, p. 426.

sect), intestinal "eating out" (eagle), goose-flesh (porcupine), incontinence of urine, incontinence of semen, gangosa (hornbill), paralysis (snake), tertiary yaws (rock limpet), wasting in hookworm (Sakwara tree), elephantiasis (shell), boils. The taboos are not only used to protect private property but also in the ordinary course of private feuds. Practically everybody in Dobu is a witch or a sorcerer.

Twice a year the Dobuan leaves his jealously guarded garden and wife and goes oversea for a Kula expedition. Kula is the strange exchange system between the islands north and south of Dobu, first described by Malinowski in his "Argonauts." From island to island, northern armshell kauris are exchanged for the southern spondylus shell necklaces. The system is not primarily economic; the exchange of northern canoes and southern pottery is quite secondary. Every object circulates. Exchange is made for the mere love of exchange. Every man has a partner on the visited islands who gives him objects, to get other objects later in Dobu. To get a good partner is thus the first condition of success in the Kula. It depends much on the personal appearance of the Dobuan, but less in the material than in a supernatural sense. For the jealous, diffident Dobuan, who is a headhunter, a sorcerer, a magical thief, the whole proceeding based on confidence and peace is purely a miracle. How can it be fulfilled? In this relation just as in courtship such magic influence upon the partner can only be obtained by secret, inherited incantations. The whole voyage is pervaded with magic (incantations of the canoe, the winds), but the most important again is the personal secret spell. Magic alone allows the Dobuan to be more successful than his fellows. And magical vengeance again will be exerted against him by his less fortunate companions.

The only place the witch-ridden Dobuan feels relatively secure is the small village (25 inhabitants) in which he is born and where he will be buried, and the only group he trusts to a certain degree is his matrilineal group, the susu, "mother's milk" (mother, mother's sisters and brothers, his brothers and sisters) from whom he inherits, who reside in the village. In case of serious illness he is immediately removed to this village. Unfortunately he passes half of his life as a pariah in another village and the prerogatives of the susu dis-

organize the family group (man, wife and children) in which he lives his whole life long. About a dozen small villages form a locality, a war unit.[55] One marries out of the village, where all children of one generation are "sisters" and "brothers," into another village of the locality. Sexual life starts long before marriage. As soon as the boy attains puberty he can no longer sleep in the house of his parents. He sleeps with girls in other villages while his sister receives other boys. He has to leave before dawn. When caught in the morning he has to marry the girl. It is characteristic of Dobu that this "free" practice goes together with an extreme prudishness in language so that missionaries did not even suspect the custom. The married pair lives alternatively one year in a house of their own in the village of the wife where the children belong and where also resides the maternal uncle who has authority over them and leaves them his skull, his incantations and his garden; and one year in another house in the village of the man where his susu lives, his inheritors (the children of his sister) and where after his death his children will not even be allowed to enter. In the village of the other susu one is not an "owner," but only a "resultant from marriage," who has not even the right to call the "owners" by their names. One feels outside of the loyal group of one's partner with his brothers and sisters and unable to avenge the partner's adultery with his village "brothers" or "sisters" (village "incest"). Marriage is an endless system of economic exchange between the villages and especially the susus of the two partners. The village of the bridegroom has not only to furnish hands, but betel, opossums, yams, arm-shells, pigs, a certain banana-fish meal, sago and taro, and receive much less in exchange from the village of the bride. These exchanges are repeated every year and become extremely heavy in the mourning year for the village of the surviving partner. Sometimes they are continued even afterwards for the love of exchange. The marital tributes are given and accepted without communal feasting and in a rather unfriendly way. As Dobuan soil is poor, very often these debts are not paid to the satisfaction of the

[55] Each village has together with other villages a totem bird, a common woman ancestor. But the totem grouping is without importance. Villages of the same totem may be members of different localities and thus be opposed in war.

other part and disease producing magic is employed as vengeance. The Dobuan always suspects his wife, his mother-in-law, or other relatives from his wife's side, of bewitching him, or vice versa. The diviner called in case of illness (from another locality—to secure impartiality and his own subsequent safety) points almost every time to such a witch or sorcerer who has justified economic griefs against the sick person. Justice is then paid and the witch exorcises the diseased. This belief acts as a kind of police and is quite apt to enforce economic obligations. The natives say: "You whites have your rifles—we have taboo, witchcraft and sorcery, our weapons." It is even the only kind of government they have, living as they do without chiefs. But it has a terribly disruptive influence upon family life. The average Dobuan divorces from 3 to 4 times during his life. He feels safer in Trobriand where he believes the women do not participate in the privilege of sorcery.[36] The great sexual freedom before marriage is not automatically replaced by great strictness after marriage like in Eddystone.[37] Coupled with a great shame of the bodily organs, a great prudishness in speech, goes a lascivious delight in cut-and-run adulteries and seductions. Jealousy therefore normally runs so high in Dobu that a man watches his wife closely, carefully timing her absences when she goes to the bush for natural functions. Children are enlisted as informants. As a matter of fact, sentimentally, the man is closer to his dog than to his wife. The arsenal of marital warfare comprises besides sorcery, witchcraft and village "incest," eventually suicide. The person wishing to maintain the marriage against the person wishing to dissolve it, usually attempts suicide, often fails to make it fatal and obtains a contemptuous maintenance of marriage, dictated more by fear of the partner's susu than by real pity.

There is no special supernatural department in Dobu. The Dobuan's life ideals, to be a good magical yam thief, a great adulterer, a successful Kula-exchanger, a strong sorcerer, to defend himself against disease, to satisfy his hatred and to punish his enemies with disease, all his fears and hopes, are covered by magic. The Dobuan sometimes practices besides taboos, also "vada," the direct magical

[36] Malinowski, *l. c.*, p. 42.
[37] Rivers, W. H. R., *Psychology and Ethnology*, London, 1926, p. 71.

assault which kills by suggestion.[38] He also uses herbs believed to be poisonous without spells, without distinguishing them clearly from the herbs employed in the magical performance. Some of these herbs are actually efficacious,[39] as proved beyond doubt in some suicides. But he does believe not less violently in the result of the materially inefficacious herbs, although he pretends to " try them out " as he does all his magic! The spirits of the dead go away to the island Bwebweso. " The Dobuan is not comfortable in the idea that the dead can do any damage. Damage is done so preponderantly by the living that this latter conception will not tolerate a rival conception easily." Almost all his supernaturals are " dependent," functioning only through magic formulas. His almost " religious," respectful attitude to these supernaturals in his formulas proves on the other hand the only relative value of such labels as " magic."

When we now turn to medicine proper in Dobu, not much is left after a general survey in Dobuan life. As disease is the principal magical weapon, as everybody fights against everybody with magic and knows disease incantations, as necessarily the sorcerer is also the healer in Dobu, there is no special medicine man and no special medical department.[40] Disease (and " medicine ") are everywhere. Death from old age or accident is not accepted as such by the Dobuans. All illness, disease and death are attributed to jealousy and provoke recrimination. We have already described the usual magical production of disease by spells introducing animal spirits into the foe's body in connection with the tree taboos. Excepted from that rule are only minor troubles like ulcers and the diseases introduced by the white man (measles, tuberculosis, influenza, dysentery) for which no incantations exist. While the sorcerer always proceeds by uttering his spell over some personal leavings

[38] This interesting phenomenon is also described in other parts of Melanesia by Codrington, *l. c.*, p. 206, Seligman, C. G., *The Melanesians of British New Guinea*, Cambridge, 1910, p. 170, 187, 695, and Malinowski, *l. c.*, p. 42.

[39] This discovery of Fortune is very interesting in comparison with the statements of Seligman (*l. c.*, p. 289) and Codrington (*l. c.*, p. 215) that in the districts observed by them no actual poisons are used. Seligman stresses rightly the great difficulties for the European to obtain information about the whole illegal sorcery complex (*l. c.*, p. 638).

[40] The strange multiplicity of " specialists " in Eddystone Island, described by Rivers in *M. M. R.*, p. 43 ff. may perhaps have similar bases.

of the victim, the Dobuan witch may also act by spirit abstraction. There is no tender feeling for the deformed and incurable in Dobu. He is "bad." His magic was weak. His ghost will not even be admitted in Bwebweso. The only professional in Dobuan medicine is the diviner who acts by water gazing or crystal gazing (after preliminary inquiry). He detects the witch or socerer and the economic background of the conflict paying strict regard to native justice. He is rather a justice of the peace than a medical man. The healing procedure is quite simple. Each taboo has its lola (exorcizing spell). The publicly exposed and publicly appeased witch or sorcerer breathes in a vessel of water and the patient is bathed with it. If he dies nevertheless, not the detected, but another, still undetected sorcerer is held responsible. Since all disease spells are believed to lead inevitably to death, the curative exorcisms are automatically credited with more power than they deserve. In rare cases where a crystal instead of an animal spirit is believed to be projected, it is removed by suction.

The unity of Dobuan culture cannot be denied, sinister as it may seem to us.[41] Supernatural beliefs enforcing lawful behavior towards neighbors are nothing unusual in Oceania.[42] But nowhere else than in Dobu do they seem to have attained such forms which almost defeat the purpose. Nowhere is every evil attributed with such consequence to human agency, nowhere else does there result a similar spirit of jealousy and thievery, of witch obsession (even in daytime the Dobuan does not dare to wander alone) and aggres-

[41] We have to be cautious with such appreciations given from outside. It seems worth while to remember here Seligman's commentary to another Melanesian culture: "Indeed, as far as I have been able to ascertain, the Papuasian of this district regards the existence of sorcery not as has been alleged as a particularly terrifying and horrible, but as a necessary and inevitable condition of existence in the world as he knows it. So that the Roro speaking tribes look on sorcery in the abstract with no more horror and fear than Europeans in their prime regard old age and death" (*l. c.*, p. 279). Even Fortune remarks once: "Dobuans prefer to be infernally nasty or else not nasty at all." On the other hand, we have even omitted a good many Dobuan horrors. Even a study of their only esthetic product, their beautiful songs, treating mostly of "love," mourning and sea-accidents leaves one deeply depressed.

[42] Fortune, R. F., Manus Religion, *Am. Philos. Soc.*, vol. III, Philadelphia, 1935; Firth, R., Economic Psychology of the Maori, *J. R. Anthr. Inst.*, 55 (1935), pp. 340-362; Malinowski, *l. c.*, p. 75.

siveness. Neighbor cultures (in the geographical and cultural sense) showing relatively small formal differences like Basima (patrilocal residence of the family) or Trobriand (rank system and chiefs, patrilocal residence) exhale quite a different spirit. Dobuan medicine owes its special features to its perfect integration with the pattern. In Dobu there is only and one cause of disease, witchcraft or sorcery. There is no possible intervention of supernaturals, independent from human agency, imposing a more impersonal sanction, acting mostly by soul abstraction, no influence of ghosts, no taboo infraction as elsewhere in Melanesia.[43] Diagnostics knows neither dreams not trance nor the sacrifice to the ancestor.[44] Treatment in Dobu is deprived of drugs as almost everywhere in Melanesia,[45] but on the other hand it is also deprived of the characteristic Melanesian mixture of spells and massage.[46] Nor are there bone setters, etc.; it is strictly reduced to the exorcising spell. Dobuan "medicine" needs no special practitioners; it is generalized, and its outstanding feature is that disease-making counts more than disease-healing.

Thongas [46a]

The Thongas are a Bantu speaking tribe, living around Lourenço Marques and numbering about 750,000 souls. They are divided into six dialect groups; each group is composed of 3 to 7 clans of several thousand members. The most solemn oath of the Thonga is that which is taken with earth. The same word "tiko" means soil and clan. The monkeys are considered degenerate human beings who lost the habit of working and of tilling fields, and thus fell into their present miserable condition. That is a typical peasant view. Although they lack the plough, manure and irrigation, Thongas have

[43] Codrington, *l. c.*, p. 208; Rivers, *M. M. R.*, p. 15 (Banks Isl., Gazelle Peninsula), p. 37 (Eddystone Isl.); Fortune, *l. c.*, p. 7, 28 (Admiralty Isl.); Seligman, *l. c.*, p. 183 (Koita).

[44] Codrington, *l. c.*, p. 208, 209; Rivers, *M. M. R.*, p. 31; *Report Cambridge Exp.* (1908), V, 362; II, 266.

[45] Codrington, *l. c.*, p. 199.

[46] Rivers, *M. M. R.*, p. 100; Wedgwood, C., Sickness and its treatment in Manam Island, *Oceania*, V, p. 280; Hocart, *l. c.*, p. 232.

[46a] Except when other references are given, the facts of this chapter are taken out of H. A. Junod *The Life of a South African Tribe*, 2 vols., London, 1913.

a rather manifold agriculture of different cereals. The country is rich in wild fruit trees. From cereals and fruits they make beer. They have also some cattle, goats, pigs, and fowl. They do a little fishing. Hunting of big game (lion, elephant, crocodile, hippopotamus) is in the hands of specialists. But in spite of these various resources there is always the danger of famine in case of drought. Women besides taking care of almost the whole agriculture are potters; men make the famous baskets, build the houses, supervise the cattle. The Thongas know iron. They know how to work and how to enjoy life. There is a real culinary art among them. Story-telling and singing is greatly cultivated. Musical instruments are highly developed. A good poet is able to make a living as a wandering minstrel. Although there is warfare, there is no genuine interest in war. Not heroic deeds give a social standing, but the number of wives! This is because more wives mean more tilled soil, more cooked food and more children to propitiate the ancestor later. Love is of little importance in Thonga life. Marriage is first and foremost an economic transaction between two families. The family of the bridegroom has to pay the "lobola" (a number of hoes) for the bride. With that lobola, the brother of the bride will buy his wife. Lobola debts are guaranteed by the whole village. Lobola debts are a permanent problem with the Thongas and poison the relations of the in-laws and the whole social life. Women have no property and form, after the death of the husband, the main bulk of an inheritance. They are distributed among his brothers and his sister's sons. Very old people are neglected.

The elementary unit of Thonga society is the village, inhabited by the headman, his wives, his younger brothers, his sons and their wives. When the headman dies, the village dies. His brother-successor builds a new one with the same population. In the village food-communism reigns, but the ancestor gods can only be approached by the headman. The villages depend on the king. The king lives materially almost at the same level as his subjects but he is a magical being, the incarnation of the country. His ancestors are the gods of the country. The soil is the king's property, justice is distributed by him. He is guided by his counsellors. He receives taxes and other services. The long custom of organized jurisdiction

gives to the people a strong sense of justice and makes them rather peaceful and law abiding.

The religious world of the Thonga is based on the same principle of familial hierarchy; as gods of the individual serve the ancestors not only of the paternal but also of the maternal line. The ancestors of the king are the gods of the whole tribe. The notion of another supernatural force, the heaven, exists only in a most rudimentary form.

Thonga religion is a strong religion without idols, temples, professional priests, special days of worship, based exclusively on prayers and sacrifices. Except in case of rain making, the sacrifice consists of fowl, goat or ram and not of men. It is somewhat surprising and perhaps shocking to some whites that the Thonga uses with his relative-gods also a more terrestrial "family" language which sometimes is more frank than respectful. Human life is for the Thonga a sequence of stages like the agricultural year. Every change seems surrounded by supernatural dangers. Thus numerous taboos have to be kept, especially in the period of these changes; numerous rites and ceremonies connected with prayer and sacrifices have to neutralize the dangers. The week after birth is full of taboo for child and mother. The baby is regarded in a supernaturally dangerous state up to its weaning. Not less than four ceremonies are performed with him and it continually receives magic medicine. Puberty brings circumcision and a hard initiation school for boys and minor rites for girls. Menstruation is always highly dangerous. Marriage ceremonials and taboos are well elaborated. Adultery is taboo and will result in protracted labor of the guilty wife and other diseases. Before the first fruits and mealies are eaten, the chiefs have to perform the luma rites, thus doing justice to the gods and guarding the hierarchic priority in consumption. Exceptional events like war, hunt, return from the Johannesburg mines, convalescence from disease, are similarily connected with taboos and ceremonials. Before marriage boys and girls enjoy sexual freedom. After marriage sexuality becomes a somewhat official affair. There is almost no event which is not connected with a sexual taboo (hunting, fishing, war, village building, mourning, menstruation, child growth, disease of a village inhabitant, etc.), almost no purification rite without a

special kind of ritual sex-intercourse. The most terrific defilement is death, the most elaborate ceremonial, mourning, ends after a year with the destroying of the hut of the deceased and the distribution of the heritage. The sons of the sister play a special role in the mourning ceremonial. The sadness and restrictions of the mourning period are in a strange way combined with drinking and feasting and the ritual use of an otherwise impossible obscene language.[47] This custom seems a psychological safety valve like under other circumstances the continuous praise of the wisdom of the little ones and the triumph of the weak in the stories of the rather highly hierarchized Thonga society. The taboos are not man made like Melanesian taboos; they are god made and are connected with prayer and sacrifice. On the other hand they have gained a kind of independence, attracting the whole fear complex, rather missing in Thonga religion proper. All Thonga life is suspended in a big net of taboos. These taboos avenge themselves almost automatically and without intervention of the gods, mostly through disease and death. The most terrible reaction against a taboo transgression is drought in the case of miscarriage and improper burying of a young child which requires a complicated purifiying ceremonial again connected with obscenity. Rain and lightning are the only supernaturally important celestial events. Dreams are of little importance.

The will of the gods is revealed to the diviners through the throwing of bones, a kind of dice. The diviners have a set consisting of dozens of bones of beasts. This set is a real " microcosm." Every bone represents an element in Thonga life. Innumerable combinations of positions are possible. The Thongas are very proficient in the art of bone throwing and greatly revere these bones.

While divining, as other magic elements, is strongly integrated in Thonga religion, magic acquires a certain independence (although even witches are controlled by the ancestor-gods) in the terrible witchcraft beliefs which the Thongas share with most other African tribes.[48] Thongas differentiate strongly between the black magician

[47] Evans-Pritchard, E. D., Some collective expressions of obscenity in Africa. *J. Roy. Anthr. Inst.*, 1929, 311 ff.; Herskovits, M. J., *Dahomey*, N. Y., 1938, vol. I, p. 387.

[48] With the disintegration of native culture witchcraft beliefs seem rather to increase than to decrease (see Junod II, 488; Field, M. J., *Religion and Medicine*

(sorcerer) and the white magician (witch-doctor). They also make some distinction between the hereditary witch (hereditary in the case of evil eye in the maternal line!) acting at night unconsciously,[49] and the sorcerer, acting consciously by black art, motivated by envy, jealousy and greed. Sorcerers form societies. The admission fee often consists of the sacrifice of his own child. (It is not clear if these facts are actual as for instance with the Manos,[50] or mere delusions as probably with the Gas.[51]) Witches kill by eating the spiritual part of the bewitched (a kind of "vada"), they enslave the killed,[52] they produce accidents especially with wild animals, they send disease producing foreign bodies or animals into the body of the bewitched, they make him go to Johannesburg and die there, and they steal the crops. Amulets, magical fences, etc. are used to protect against witchcraft. The main fighter against witchcraft is the witch doctor, who thus gains great importance in upholding the social order.[53] His methods for smelling out the sorcerers are: questioning, trance and ordeal. As in many other parts of Africa the ordeal in Thonga is a poison-ordeal, the drinking of the mondjo. The mondjo is a plant of the Solaneae family with intoxicating properties. At the same time the witch doctor hypnotises his victims.

of the Ga People, Oxford, 1937, p. 135; Evans-Pritchard, E. E., *Witchcraft, Oracles and Magic among the Azande*, Oxford, 1937, p. 446) "The secularization of modern life has proceeded at the expense of religion and its gods rather than at the expense of magic" (R. Benedict, *Encycl. Soc. Sc.*, vol. X, p. 41). This phenomenon perhaps gives the answer to the famous question of "degeneration of religion into magic."—Generally in the course of this article we were unfortunately obliged to treat primitive societies as static. We tried first to describe the place of the institution in a given society. We had to disregard the shifting of interest from one institution to another in one society, described for instance by R. K. Merton, *Osiris* IV, 1938, 360-632, for the 17th century in England, which of course exists also in primitive society!

[49] See also Field, *l. c.*, p. 135. But Thongas have not the elaborate anatomical ideas in hereditary witchcraft which are reported from the Azande (Evans-Pritchard, *l. c.*, 387-391), the Liberian Manos (Harley, G. W., *Native African Medicine*, Cambridge, Mass., 1941, p. 23, 185) and the whole "likundu" district (Baumann, H., Likundu, *Zschr. f. Ethnol.*, 1928.)

[50] Harley, *l. c.*, p. 23.

[51] Field, *l. c.*, p. 139.

[52] This old African idea is still flourishing even among the Haitians (Herskovits, *l. c.*, II, p. 244).

[53] See Ackerknecht, *l. c.*, p. 515.

Astonishing confessions are obtained,[64] which emphasizes the general belief in witchcraft.

Disease is either itself one of the mysteriously dangerous situations in Thonga life or it is the outcome of such a taboo-situation. Thongas are ridiculed for having only a few disease names and calling the rest of the diseases after the diseased organ. But could not that custom be the consequence of a taboo against disease names such as exists elsewhere in Africa?[65] Anyway, they know syphilis, gonorrhoea, consumption, "fever," smallpox, scarlet fever, leprosy, rheumatism, tonsilitis, hematuria, dysentery, colic, headache, hydrocele, bilharzia, lumbago, scabies, cough, worms, and most feared of all, mental diseases and epilepsy. Except for the few cases caused by witchcraft or the "heaven," diseases are sent by the ancestor gods; they are a consequence of taboo transgression (for instance consumption for not respecting mourning ritual; insanity for not purifying after hunt, hydrocele when men enter Kafir peafields) or the taboo situation (defilement of death, birth, etc.). Leprosy and consumption are regarded as magically contagious to the relatives. Death in old age is regarded as natural. Children are not allowed to mock cripples.

Diagnosis of course is obtained from the bones, which also prescribe prayers and sacrifices. There are no incantations. The central element of Thonga therapy is the medicine, a mixture of drugs and other magical substances. The medicine is given by the gods but its acting element seems a special mystical, purifying force circumscribed by such general notions as "moya" (signifying also wind, breath, spirit of alcoholic beverages) or "muri" (meaning tree, plant, herb, but also any means of producing any effect or any influence). This dynamic conception suggests somewhat the Liberian "nye"[66] or even the Melanesian "mana." Junod counted 40-50 drugs and 20 prescriptions. None seems to have the immediately convincing actual value of other African drugs and poisons with which undoubtedly the drug and not suggestion work. Anyway there is no differentiation between actual and only magically efficient drugs. Thonga inoculate against snake-bite by rubbing snake ashes into the

[64] Junod II, p. 486; see also Field, *l. c.*, p. 129; Harley, *l. c.*, p. 27; Lowie, *l. c.*, p. 37.

[65] Harley, *l. c.*, p. 39; Field, *l. c.*, p. 120, etc.

[66] Harley, *l. c.*, p. 13.

incisions.[57] They also inoculate against smallpox.[58] Together with medicine the Thonga also use cupping, cauterizing and the sweat bath. A most ingenious procedure is the bringing up of premature children in warm pots. Surgery does not exist. Every grave disease is "closed" by the hondlola rite. The hondlola rite (a rite of purification, performed also after weaning, for unsuccessful girls, in mourning, after the diviners initiation) seems to show that for the Thonga a serious illness constitutes a marginal period after which the patient must be aggregated afresh to society.

The profession of the medicine man is hereditary, descending from the father or the maternal uncle. Sometimes the heritage of knowledge is small but a good medicine man tries to combine the activities not only of the diviner and therapist, but also of the witch doctor, the rain and the war-magician-priest, and thus gains a high social standing. There are no pure herb doctors and no woman in the profession. There is no ecstatic behavior or special dress. The forked pole in the village of the medicine man, is a kind of altar where he prays to the ancestors and suspends the medicines, the knowledge of which he inherited from them. Once a year in a special feast the medicines are renewed and a kind of luma of the medicines is celebrated. The medicine man charges a considerable fee.

Witchcraft, which acts by soul abstraction as well as by spirit intrusion, is of course treated differently. The witch has to recall his spells. Quite a special chapter in Thonga medicine is possession. A foreign spirit (generally of a dead Zulu) takes possession of the patient and produces a nervous crisis which has some resemblance to hysteria, but also to schizophrenia and to amuck. An exorcism ceremony—there are different "schools" of men and women specialists in exorcising—with a lot of drumming, singing, medicine, blood drinking and vomiting expells the spirit. But the patient has to celebrate protective rites which represent a worship of the spirit, during his whole future life. He enters a society of exorcised and becomes himself an exorciser. Practically he still seems ill, but is

[57] This apparently successful and rather astonishing procedure is described also by Harley for the Manos (*l. c.*, p. 213) who quotes there 6 other African testimonials for the same custom. See also Lebzelter, V., Zur Heilkunde der Bergdama, *Zschr. Ethnol.*, 1928, p. 305; Hewat, M. L., *Bantu Folklore*, Cape Town, 1906, p. 94.

[58] For Manos and literature on other tribes, Harley, *l. c.*, p. 217.

converted to a kind of new " religion." It is quite typical that possession, like witchcraft, increased enormously in Thonga during the last 80 years. Conversion to Christianity heals in Thonga but that seems rather the consequence of conversion as such than of the special creed thus acquired; in Ga a similar accident with people already converted to Christianity is healed by their becoming a professional medium, mouth-piece of the heathen gods.[59]

In Africa similar cultures are covering large sections and sharp cultural limits are less developed than among Oceanic islands.[60] Nevertheless, seen against the background even of African cultures with similar tendencies, Thonga society has quite a silhoutte of its own. There is neither the economic richness and differentiation in trade and crafts, the accumulation of property for heritage, the conspicuous consumption in sacrifices, the esoteric knowledge of an enormous " Olympus " by a priestly class, nor the harsh but perfect political organization of absolutism as in Dahomey. There are no Zande classes, no Ga towns, no Zulu warrior kings, no Liberian secret societies. Dreams are of small importance, witchcraft never becomes a universal factor. There is neither the pananimism of the Manos nor the complete absence of spiritualism of the Kpelle. There is a society of families of peasants, governed by their dead elders and one outstanding family, with a celestial world as simple and undifferentiated as their own family, with a wealth of terrestial and supernatural rule, a certain amount of anxiety as in all men, but a well developed ability to enjoy a hard and simple life.

Thonga medicine is consistent with this picture. The family organizes the daily life, the ancestors rule that life; they give taboos and they give disease. The fundamental attitudes of the Thonga: his relation to the ancestors, to legal order in the natural and supernatural world, his behavior to wòman, pervade also medicine. In its grouping around the taboo idea,[61] Thonga medicine lacks some traits typical of other African cultures. There is no differentiation

[59] Field, *l. c.*, p. 101.

[60] Ankermann, B., Kulturkreise und Kulturschichten in Afrika, *Zschr. Ethn.*, 1905.

[61] Observed in a less central position naturally also in other African tribes. See Harley, *l. c.*, p. 39; Field, *l. c.*, p. 7; Herskovits, *l. c.*, I, p. 397; Westermann, D., *The Shilluk*, p. XXIII.

into natural and supernatural diseases,[62] not the wealth of surprisingly efficient poisons and drugs (antispasmodics, diuretics, abortives), specifics against venereal diseases, malaria, anthrax, and perhaps even lepra.[63] There are no bone setters, no sick huts. On the other hand no fetishes, no spells, no drug revealing dreams and ecstasies exist. Spirit-intrusion acts only in the relatively rare possession. Thonga medicine guards the simple and law-abiding character of its society.

* * *

We hope that our material brings out with sufficient clarity the following three points:

There is primarily not one "primitive medicine" but there are numerous different primitive medicines. Although the choice of our tribes was purely incidental, dictated only by the availability of good material, both general and medical from one author—a thing unfortunately much rarer than is generally supposed—no one of our tribes seems to correspond to the time-honored scheme of "primitive medicine." Although incidentally all three tribes emphasize the spiritual rather than the technical element (we would appreciate very much if in discussions on primitive medicine the misleading term "rational" could be replaced by the more exact term "technical"), they are still different enough the one from the other.

The differences between primitive medicines are much less differences in "elements" (they have a lot of common elements), *than differences in the medical "pattern"* which they build up and *which is conditioned fundamentally by their cultural pattern.* There is no inevitable position which illness and the healing art must take in society. Disease may be regarded in its narrowest physiological limits and even below them or may become a symbol for dangers menacing society through nature or through its own members. It may seem a mere incident or reach the rank of a goddess. Society unconsciously gives these different places to disease in the course of history.

This fact may also throw some light on the question why the

[62] Harley, *l. c.*, p. 197.

[63] See Harley, Lebzelter, and Delobsom, D., *Les secrets des sorciers noirs*, Paris, 1934.

rhythm and the lines of development in medicine were and are so different, uneven and unequal. Were medicine but a quasi-biological reaction of society towards the general fact of disease without interference of general cultural trends, the striking neglect of the obvious, the painful and costly adherence to the inefficacious or obnoxious in certain societies, the miraculous insights and progress in others would be hardly understandable. It is not the special amount of intelligence or stupidity in a given culture to which we can attribute the responsibility for these facts, but the existence of fortunate or unfortunate cultural attitudes, often in no way connected with healing, which give us the correct explanation.

The degree of integration of the different elements of medicine into a whole and of the whole medicine into the cultural pattern varies considerably. There is no doubt, for instance, that the integration is more complete in Dobu than in Thonga and in Thonga than in Cheyenne.[63a] In the present state of our knowledge the reason seems historical. Rivers [64] explained this fact by the tendency of borrowing culture elements and the blending of cultures.[65] Even when we suppose an isolated development in the tribe, the fact that different sections of tribal life do not advance at the same rate may at least partly explain our phenomenon. Medicine in primitive society is incidentally part of the spiritual section which often seems more conservative than the purely technical.

We abstained consciously from general deliberations like evaluation of the worth of primitive medicine or the deeper meaning of magico-religious practices. We have dealt elsewhere with these questions.[66] We consciously abstained from creating definite "types" of primitive medicine or from accepting one of the existing classifi-

[63a] Incidentally the three cultures described all reach in the field of their medicines a certain degree of integration, so that one can speak of a "typical" disease cause (e. g. Cheyenne: spirits; Dobu: sorcery; Thonga: taboo-transgression), of a "typical" way of diagnostics or therapeutics etc. But that is by no means necessary or general. There are numerous tribes (e. g. Dahomey-personal communication of Prof. Herskovits) where different ideas concerning the cause of disease, the ways of healing etc. are coexistent without one of them being considerably more important than the others.

[64] Rivers, *M. M. R.*, p. 98 ff.

[65] Concerning the "incessant tendency of borrowing" see also Lowie, R., *Primitive Society*, London, 1929, p. 435.

[66] Ackerknecht *l. c.*, p. 511, 516.

cations, not because we deny the possibility or necessity of such a classification, but because answering that question can never be the object of an article and seems to be premature before a thoroughgoing reexamination of the material, including a study of medical *objects* and of *time relations* in primitive culture. We are rather sceptical concerning the possibility of evolutionary schemes, but we think that already a large comparative study of primitive medicine would be a great value for medical history and medicine as a whole. We even sincerely believe that general anthropology would profit from such studies. As the study of the handwriting of a person, an isolated and rather insignificant trait, can throw a new light on the knowledge of the whole personality, so sometimes the study of an art, law, language, object, family-system, religious belief throws light on a whole culture. And why not medicine? General historians at least begin to accept this argument for historical research. We tried to be extremely careful concerning the *causal* implications of the whole pattern as well as of the medical practices. It is sometimes a great temptation to explain the causal necessity of things in terms of psycho-biology,[67] environment or material culture instead of simply stating the connection of the facts. Such an explanation may even be possible for simpler traits.[68] In a complex phenomenon like medicine, not to speak of a culture pattern, one realizes soon enough that he took for a real cause what was a mere occasion which permitted the observed development. The unconscious subjective factor of choice and decision, which characterizes all human activity and the real tendency of which so far we do not know, generally spoils such plain causal considerations. We think that in spite of these our subjective and objective limitations the simple study of the *various possibilities and connections in culture and medicine* exemplified here by the Cheyennes, Dobuans and Thongas already has its value.

[67] In an extremely interesting article "The probable origin of man's belief in sympathetic magic and taboo" (*Med. Jour. and Record*, vol. XXXIII, 1931), Dr. E. J. Kempf describes in terms of nervous physiology (conditioned reflexes, etc.) how magic works, thus greatly enlarging our understanding of the process. But the fact that magic acts in this way is no explanation why humanity chooses first the way of magical thinking instead of another way physiologically not less "natural."

[68] Hobhouse, L. T., Wheeler, J. C., Ginsberg, M.; *The material culture and social institutions of the simpler peoples*, London, 1930.

THE DEVELOPMENT OF THE COMPOUND MICROSCOPE

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The history of the invention of the compound microscope is based upon the discovery and use of lenses. Just who discovered the fact that curved surfaces of glass enlarged objects observed through them, is not known. It is evident, however, that this phenomenon was unknown to the ancients and came into man's observation sometime during the thirteenth century when it was utilized for making spectacles. Roger Bacon, 1214-1294, describes this phenomenon in the portion of his Opus Majus devoted to Optical Science: "If a man looks at letters or other small objects through the medium of a crystal or a glass or of some other transparent body placed above the letters, and it is the smaller part of a sphere whose convexity is toward the eye, and the eye is in the air, he will see the letters much better and they will appear larger to him. For in accordance with the fifth rule regarding a spherical medium beneath which is the object or on this side is its center, and whose convexity is toward the eye, all conditions are favorable for magnification, since the angle is larger under which the object is seen, and the image is larger, and the position of the image is nearer, since the object is between the eye and the center. *Therefore this instrument is useful to the aged and those who have weak eyes for they can see a letter, no matter how small, sufficiently enlarged.*" [1]

There is some doubt as to who first invented spectacles, for several records ascribe the invention to different persons. They were mentioned in a manuscript by Redi, 1299 A. D., as having been lately invented, and are mentioned in several other manuscripts of the period, 1300-1320, as a recent invention. An interesting inscription which is found in the church of St. Maria Maggiore in Florence is quoted as follows: "Here lies Salvino degli Armati of Florence,

[1] Bacon, Roger, *Opus Majus, Trans. Robert B. Burke*, Univ. of Penn. Press, 1928. Vol. II, p. 574.

inventor of spectacles, May God pardon his sins. MCCCXVII."[2] Thus it seems evident that spectacles were invented in Italy about the end of the 13th century. They were probably made with convex lenses and used only to aid the eyesight of the aged or weak. The use of concave lenses for people suffering from myopia (nearsightedness) came at a later date and 200 years after Bacon we find frequent references to them in literature.

The making of simple magnifying lenses developed rapidly and many writers refer to them and describe them with much mathematical detail. It gradually developed that most of the making and improvement of lenses lay in the hands of spectacle makers and this profession spread from one country to another and was handed down from father to son. The idea of using a combination of lenses to increase magnification or to bring objects nearer as well as to increase their size was slow in developing. It was nearly three centuries later that this idea occurred to a spectacle maker in Holland.

The invention of the compound microscope has usually been attributed to a Dutchman by the name of Jansen in 1590, but there seems to have been some controversy as to which of three men was the actual inventor of the compound microscope. The invention of this instrument went hand in hand with that of the telescope and it is difficult to tell which one was discovered first. It seems logical to think that no one person suddenly discovered the results which could be obtained by using two lenses, but that from time to time makers of spectacles and lenses experimented with the effects of different combinations and were interested in the results obtained. It remained for some one to fasten two lenses in a tube which could be adjusted to different lengths and by using different combinations of lenses and distances bring far objects nearer and enlarge them, or to increase the size of nearby objects so that tiny grains assumed the size of visible objects.

That this experiment may have been tried in several different places by different optical workers is evident in the literature, for we find that the invention of the compound microscope was ascribed

[2] Wilde, Emil, *Geschichte der Optik* (2 parts), Berlin 1838-1843, p. 94; in Disney's *Origin and Dev. of the Mic.*, London, Roy. Mic. Soc., 1928, p. 27.

not only to Jansen in Holland but to Drebel,[3] a Dutchman living in London, in 1621, and to Galileo in Italy in 1624.[4] Besides these already mentioned there were others who claimed this distinction from time to time. Of this list of possible originators of the compound microscope which has come to be so invaluable to students of biological sciences, two men seem worth considering in some detail, because there are records which seem authentic by which the claim of each is justified.

From a letter written by William Borelius, the Dutch Ambassador to the Court of Louis XIV, which has been preserved, we learn some interesting facts about Zacharias Jansen which are worth quoting: "Near the house where I was born, in Middleburg, the Metropolis of Zeeland, is a somewhat mean dwelling which was inhabited in 1591, the year of my birth, by a certain maker of spectacles named Hans (his wife was Maria) who in addition to two daughters, had a son named Zacharias, whom I knew very intimately, because as one neighbor with another he was my playmate from very tender years, and I, as a boy, frequently paid a visit to his workshop. This Hans, that is John, with his son Zacharias, as I have often heard, were the first to invent microscopes, which they offered to Prince Maurice, Stadtholder and Commander in Chief of the army of Federated Belgium, and were recompensed with some payment. A similar microscope was afterwards offered by them to Albert, Archduke of Austria, the supreme Stadtholder of the Belgium Kingdom. When I was Legate of England in the year 1619, Cornelius Drebel, a Dutchman of Alkmaar, a man versed in many of nature's secrets, and serving there as a mathematical advisor to King James, being also an intimate friend of mine, showed me that very same instrument which the Archduke had given to him (Drebel) as a present, viz: the microscope of that very Zacharias, and it was not (as such things are now made) with a short tube, but one almost a foot and a half long, the tube itself being of gilded brass and of two inches of width in diameter, mounted on a basal disc of ebony, which disc was for

[3] Disney, H., *Origin and Development of the Microscope*, London, Roy. Mic. Soc., 1928, p. 101.

[4] Govi, G., The Compound Microscope Invented by Galileo, *Jour. Roy. Mic. Soc.*, 1889, p. 575.

receiving sundry trifles or tiny objects which we viewed from above and saw them enlarged to an almost miraculous size." [5]

There is an interesting sequence to the presentation of the microscope to Drebel by the Archduke. In 1621 Drebel who was still living in London, began to manufacture microscopes similar to the Jansen instrument. The following year Jacob Kuffler, a relative of Drebel, brought one to Rome as a present to one of the Cardinals from Nicholas Fabri de Peiresc of Paris. Before he had opportunity to explain the use of the instrument, Kuffler died, so the specimen remained a mystery. Two years later de Peiresc sent two more specimens with instructions for their use. One of these was a simple magnifying glass but the other consisted of two glasses and nobody in Rome could make anything of it, even the mathematicians. About this time Galileo arrived in Rome and was shown the instrument. He told his friends that he had made a similar instrument many years since which "magnified things as much as 50,000 times, so you could see a fly as large as a hen." He made some specimens showing objects erect and sent them to his friends. He sent one to Prince Federigo Cesi on the 23rd of September, 1624, with the following letter: "I send your Excellency a little spy glass (cochialino) for observing at close quarters the smallest objects, which I hope will afford the same interest and pleasure that it has to me. I delayed in sending it because my first attempts were imperfect by reason of difficulty in fashioning the lenses. The object is placed on a movable circle (at the base of the instrument), which can be turned in such a way as to show successive portions, a single pose being unable to show more than a small part of the whole. As the distance between the lens and the object must be precisely adjusted in order to see things that are in relief, it is necessary to bring the glass nearer to or farther from the object according to the parts to be examined. Therefore the little tube is made adjustable on its stand or guide. The instrument should be used in strong light or in full sunlight, so as to illuminate the object as much as possible. I have examined with greatest delight a large number of animals, amongst which the bug is most horrible, the gnat and moth very beautiful. I have also

[5] Barellus, Petrus, *De Vero Telescopii Inventor*, Hague, 1665, in Disney's *Origin and Dev. of Mic.*, London Roy. Mic. Soc., 1928, p. 91.

been able to discover how the fly and other little animals are able to walk on window panes and ceilings feet upwards. But your Excellency will have the opportunity of observing thousands of other details of the most curious kind, of which I shall be glad to have an account.

P. S. The little tube is in two pieces so that you may lengthen or shorten it at pleasure." [6]

For over two hundred years there was little advancement in the perfection of the microscope. At first the attention of most of the scientists was centered on the revelations of the telescope and they bent their efforts towards improving this instrument and centered their attention on the heavens. Kepler, Galileo and others were trying to work out mathematical problems in connection with the phenomena which were being found to exist in the surrounding atmosphere. Small wonder that there was little interest in perfecting an instrument which was used more for pleasure and enjoyment than in discovering new worlds or unknown facts about materials in the known world.

Since the originator of the compound microscope was a native of Holland it is not surprising that a fellow countryman should have interested himself in constructing lenses by means of which he could pry into the secrets of nature and disclose a world of invisible creatures which had been totally unknown and neglected by those early users of the microscope. Strangely enough this discoverer was not a maker of spectacles or lenses by trade, but a linen draper who lived in the city of Delft, Holland, and amused himself during his leisure moments with a hobby which nearly became his real vocation. Anthony van Leeuwenhoek became interested in the grinding of lenses and in looking at all sorts of materials to see what he could find out about them. No doubt his original purpose was to examine the textiles with which he dealt to determine their quality, but he continued to expand his fields of observation and to find many interesting and delightful things in the most curious materials and places.

Anthony van Leeuwenhoek was not a well educated man although

[6] Singer, Charles, *Studies in the History and Method of Science*, Oxford, 1921, Vol. II, pp. 230-231.

he could read and write in his own language, he was not well versed in self expression but after exploring many different materials, the urge to write down and describe those things which had so excited his interest became too great, so he began to record his discoveries. His records and descriptions of invisible forms of life are well known and not pertinent to this paper, but the fact that he used only simple lenses, as far as we know from his descriptions, is interesting for the compound microscope must have been available for his use. Apparently he was not interested in using it and more interested in perfecting simple lenses which would magnify as highly as the compound instrument of the day. If the early descriptions can be relied upon, the compound microscope of Leeuwenhoek's day was a clumsy, awkward affair which was difficult to adjust and over which one had to stand long hours in order to make the kind of observations in which Leeuwenhoek was interested. No doubt he felt that a simpler instrument to manipulate would be far more desirable. It lay with other workers to bring the compound microscope to the degree of perfection in which we find it today.

There were many difficulties to be overcome before it could be made available for practical use. In the first place the lenses had to be carefully ground, polished and then adjusted to produce the desired magnification. The mounting of the lenses, and the adjustment of them in relation to both the object and the eye of the observer as well as to each other offered problems which could only be solved by mathematical computations far beyond the scope of the average microscopists of the seventeenth and eighteenth centuries. They turned their attention, therefore, to perfecting simpler lenses and increasing their magnifications.

At first these lenses were made by dropping globules of melted glass from the point of a needle,[7] or running it through holes in a metal plate, but they were far from satisfactory so the art of grinding and polishing lenses was established. As previously noted Anthony van Leeuwenhoek far excelled in this art. The lenses employed in the early compound microscopes were made from ordinary glass and were not corrected for focal distances nor for spherical nor chromatic aberrations. Thus objects lacked definition and were

[7] Hooke, Robert, *Micrographia*, London, 1665, Preface, p. 22.

often obscured by the colors produced by chromatic aberration. The adjustments necessary to secure a satisfactory focus and magnification were tedious and had to be repeated each time the object was changed.

Since knowledge of optics was in its infancy and the need of the application of mathematical calculations was not appreciated, experimenters turned their attention to the perfection of the stand and beautifying the instrument itself. The tubes were long and the various means of adjusting the light, focusing the lenses and arranging the object were worked out in an elaborate manner so that the instruments preserved to us from this period are cumbersome in the extreme.

Another reason why the development of the compound microscope was slow, was the fact that it was not a scientific instrument. It was a toy which served to entertain and amuse those who could afford to acquire it. It was not used for the investigation of the unseen world but to enlarge the size of visible objects and to bring out their structure and composition more clearly. Not even the researches of Leeuwenhoek and Hooke stimulated any interest in studying *invisible* forms of life in the materials which were common in the environment of every individual.

Benjamin Martin was a manufacturer of optical instruments in Chichester, England. He devised many ingenious improvements in the mechanism of the microscope such as mounting it up on a ball and socket joint so it could be placed in any position, and a rack and pinion arrangement for adjusting the focus as well as several other mechanical improvements.[8] He is credited with producing an achromatic lens in 1759 which he described in a paper, but the need for delicate focusing or higher magnification not being apparent at this time, he did not continue his investigations in this field.[9]

The first attempt to correct chromatic aberration was made in connection with the telescope by Hall in 1733 and later improved by Dolland (1757) whose system the "telescopic triplet" is still in use. It was many years later that this principle was applied to the micro-

[8] Clay and Court, *History of the Microscope*, London, 1932, p. 155.
[9] Carpenter, Wm. B. and Dallinger, W. H., *The Microscope and its Revelations*, Blakiston and Co., Philadelphia, 7th edition, 1891, p. 145.

scope because the minute size of the lenses made it difficult to attain the necessary accuracy in the adjustment of the different curvatures. The first successful attempt was by Bernardino Marzoli in Italy, an amateur optician, who exhibited an achromatic objective which he had made in 1811. This was presented to the Royal Microscopic Society, London, in 1890 and is still preserved by them.[10]

It was not until 1823, however, that the demand for a better instrument stimulated a desire to increase the magnifying power of the microscope. Optical workers in several different countries began working on the problem almost simultaneously. They apparently did not know of Marzoni's objective, but carried on experiments with different kinds and combinations of lenses until we find Selligne and Chevalier in France, Frauenhofer in Germany, Amici in Italy, and Tully in England, each, having been working independently, announcing the successful production of an *achromatic objective* in 1824. The most complete and satisfactory objective was accredited to Tully.[11]

It consisted of a combination of three lenses with a focal length of 9/10 inch and the necessary corrections for aberrations. Although this lens was regarded as perfect at the time, it was not of high power nor of large angular aperture so that second combinations had to be added to obtain these conditions. About this time J. L. Lister in England made an epoch making discovery concerning achromatic objectives when he showed that two aplanatic foci may be produced by a combination of lenses and that the aberration of one doublet may be neutralized by a second.[12] The practical value of this discovery was manifested by the rapid production of achromatic objectives by such professional opticians as Ross, Powell, and Smith in London.

Immersion Objectives

As time went on attempts were made to improve the achromatic objectives so they could be used for higher magnifications. Trials were made with different combinations of flint and crown glass to

[10] Mayall, A Description of Bernardino Marzoli's Achromatic Objective (1811), *Jour. Roy. Mic. Soc.*, 1890, p. 420.

[11] Carpenter, Wm. B., Dallinger, W. H., *The Microscope and its Revelations*. Blakiston Co., Phila., 1891, 7th Ed., p. 303.

[12] *Ibid.* p. 304. Citation from *Jour. Roy. Mic. Soc.*, London, 1830.

bring about these improvements, and between 1840 and 1845 *Amici* announced the first immersion objective. This was originally designed to be used with certain oils, but the amateur microscopists of the time complained that the oil injured their slides, so they were adapted for water immersion. These were exhibited in Paris in 1855.[13]

Later, Pragmowski and Hartnack developed water immersion lenses to such a high degree of perfection that they were awarded first place in the Exhibition at Paris in 1867. Powell and Lealand in London also adapted this system for their instruments and succeeded in out distancing the Paris opticians.[14] Meanwhile an American inventor of great skill and precision had been endeavoring to improve microscope objectives and had been experimenting with immersion lenses of greater aperture than those already developed. In 1873, Robert Tolles of Boston, Mass., produced a 1/10 immersion objective with an aperture greater than that corresponding to the infinitely near, or 180° in air. It was a three lens system and had an aperture of 110° or 1.25 N. A. when immersed in soft balsam in which it gave the best results. At the same time, Tolles also introduced another immersion lens for glycerine, having a duplex front and a 110° balsam angle. These were the first objectives to be devised, for immersion materials having very nearly the same refractive index as the crown glass of which they were made, which proved satisfactory for practical use. Both of these objectives are now in the possession of the Army Medical Museum in Washington, D. C.[15]

During this period of development of lenses, other parts of the microscope had to be improved to meet the needs of finer adjustments for focusing, etc. All sorts of contrivances for moving the *stage* were attempted and the first fine adjustment screw was designed and eventually applied to the body tube after having been tried on the stage, but microscopes were still large in size and unwieldy to use.

It was largely due to the efforts of Professor E. Abbe of Jena, Germany that the microscope in its present form was developed. To

[13] Mayall, John Jr., *Cantor Lectures on the Microscope*, London, 1885.

[14] Carpenter, Wm. B., Dallinger, W. H., *The Microscope and its Revelations*, Blakiston Co., Phila., 1891, 7th. Ed. p. 310.

[15] Blackham, Geo. E., Memoir of Robert Tolles, *Proc. Amer. Mic. Soc.*, New York, 1884, pp. 43 and 44.

the average student Professor Abbe is known for the invention of a substage condenser, and one little realizes the debt we owe to Professor Abbe's keen mind and persistent efforts to make the microscope a better and more practical instrument. Therefore, we should give some space to the life and work of Professor Abbe at this point.

Ernst Abbe, the son of a foreman in a spinning mill, was born at Eisenach in the Grand Duchy of Saxe-Weimar on January 23, 1840 and died at Jena on January 14, 1905.

He attended the University of Jena and later entered the University of Gottingen where he presented a thesis on, " The Mechanical Equivalent of Heat " for his degree. After teaching at Frankfort-on-Main, he was appointed Lecturer in Mathematics, Physics, and Astronomy at the University of Jena at the age of 23. Three years later he became a scientific adviser for the firm of Carl Zeiss and remained with this firm until the end of his life, becoming a partner in 1875 and sole proprietor after the death of Carl Zeiss in 1888.

Abbe devoted his life and thought to the perfecting of the compound microscope and making it of practical value to the amateur as well as the expert microscopist. So successfully did he accomplish this idea that Zeiss Microscopes have been famous the world over for their accuracy and perfection. A few of his achievements should be mentioned.

After two years with Carl Zeiss, Abbe introduced a new method of microscope construction consisting in the complete theoretical determination of the required data *beforehand*, thus doing away forever with the former trial and error methods by which microscopes had hitherto been constructed. He was able to accomplish this because, although he had not given much time to the study of optics, he came to his task with an open mind, unhampered by preconceived ideas.

His first important contribution to the science of optics was the " Diffraction Theory " based on his discovery of the modifications produced in the image by the diffraction action of the object itself in the light by which it is illuminated. As a result of his work in this field, he was able to show that there was a difference in the images made from luminous and non-luminous objects, and that the method of lighting had a definite effect on the accuracy of the image. There was also considerable controversy over the question of aper-

tures for which Abbe worked out a solution and it is to him we owe the terms "*numerical aperture*" and "apertometer," an instrument which he devised for measuring the numerical aperture of objectives.[16]

This work on diffraction and apertures led Abbe to the introduction of the Homogeneous Immersion System for Microscope Objectives. Curiously enough when he first conceived the idea he little realized the wide range of its application and did not follow it up. Referring to Mr. J. W. Stephenson's (Treasurer of the Royal Microscopic Society) suggestion that he work out such a system, Abbe writes as follows, "The idea of realizing the various advantages of such a kind of an immersion lens by constructing objectives in this system, had for sometime presented itself to my mind, but I thought that there was not much to be expected in regard to the scientific usefulness of such objectives since I believe their use would be limited on account of using oil or some other inconvenient material as the immersion fluid. *It appeared to me that, except perhaps for the examination of diatoms, scarcely any other scientific value remained than petrographic research which would afford a scope for realizing the optical advantages of such objectives.* . . . Having now been used by a number of microscopists it has been found that, although the nature of the immersion fluid will naturally much restrict the employment of such objectives, it does not present any obstacle to their use in various widely different spheres of microscopical research; and in particular biology furnishes many problems to which the new lenses may render useful service."[17]

Abbe further describes his search for a suitable immersion fluid and found that the nature of the material did not matter, "so long as it is homogeneous, transparent and equal, or very nearly equal, to crown glass in refraction and dispersion." He found that it was very difficult to find such an apparently simple material and after examining the refraction and dispersion indices of over 100 fluids and directing the testing of some 200 chemical compounds in the Jena University laboratory he did not find one which he could use, either alone or mixed with other fluids. He tested such materials as

[16] "Ernst Abbe" (Obituary Editorial), *Jour. Roy. Mic. Soc.*, London, 1905, p. 156.

[17] Abbe, E. On Stephenson's System of Homogeneous Immersion for Microscope Objective, *Jour. Roy. Mic. Soc.*, 1879, London, p. 256.

essential and fatty oils, and artificial chemical preparations, but in only a few cases did they satisfy the conditions with sufficient accuracy to consider them of any value for immersion purposes. "The most suitable fluid examined," writes Professor Abbe, "was found to be *cedar wood oil*, an essential oil, almost without color or smell, not volatile, but unfortunately rather thin. Its refractive index at a medium temperature is 1.51 (crown glass being 1.515-1.520) while its dispersion only slightly exceeds that of crown glass. These objectives have, therefore, been constructed for use with this oil."

Thus was born in 1879 the homogeneous oil immersion lens which proved far more satisfactory than those of Tolles or Amici and on which bacteriologists, histologists, and other microbiologists today depend. Toward the end of the paper Professor Abbe refers to the satisfactory results reported by Dr. Koch of Wallestein when he used his lens.[18]

There were other difficulties than that of securing suitable immersion fluids in order to use this lens to the best advantage. The objectives were dependent on the length of tube and could only be used with the tube length to which they were originally adapted. Illumination was another important factor and it was found that the chromatic substage condenser devised by Abbe in 1873 met the conditions, but the need of a type of lens which would still further correct the chromatic aberration was still to be met.

Apochromatic Lenses

Unsuccessful attempts to produce new kinds of optical glass were made by *Fraunhofer* in Germany and Harcourt, an English clergyman,[19] who was reported in 1871 by Stokes. Some years later (1875) a paper by Abbe appeared in which he stated that there was little hope for further improvements in the compound microscope unless a new kind of glass could be produced which would still further correct chromatic and spherical aberration. Since the manufacture of such glass was expensive and the market limited, the commercial glass makers were not interested in producing it. This article induced

[18] Abbe, E., On Stephenson's System of Homogeneous Immersion for Microscope Objective, *Jour. Roy. Mic. Soc.*, London, 1879, p. 256.

[19] Hovestadt, H., *Jena Glass*, London, 1902, p. 1.

Dr. Schott, who was interested in glass making, to attempt to produce a suitable optical glass in cooperation with Professor Abbe. They finally were accommodated by the Jena Glass Works and received the financial backing of both the Zeiss Optical Company and the Prussian government.[20]

After repeated tests, using in addition to the usual six elements for glass production at that time, 28 new ones in different quantities and combinations, small amounts of glass were made and their qualities for optical purposes tested by Professor Abbe.[21] After five years of investigations, the desired glass was finally obtained by introducing fluorspar as an ingredient of the glass.[22] Thus in 1886 the apochromatic lens came into being, a most satisfactory lens for careful microscopic research; for it abolished the secondary spectrum and corrected chromatic aberration for more than two colors as well as increasing the critical magnification. A set-up of apochromatic lenses with their compensating eye pieces was completed in accordance with Abbe's calculations from this new glass in July 1886.[23]

Besides perfecting the objectives of microscopes and devising new kinds of glass for perfect optical use, Abbe was concerned in developing or perfecting other types of scientific apparatus. He devised a Refractometer and a Spectrometer, both of which bear his name, as well as a Camera Lucida and a Microscope Illuminator. He was instrumental in the development of the binocular microscope and the improving of many of the parts so that the instrument could be used to better advantage and with greater ease.

Oculars

The eye piece or ocular is an important part of the microscope and various special types have been introduced from time to time, but the one most generally used is known as the *Huyghenian*. It was first constructed by Christian Huyghens, a Dutch scientist who lived in the 17th century.[24] He made it for the telescope but it was soon adapted to the microscope. It consists of two planoconvex lenses with

[20] *Ibid.*, p. 5.
[21] *Ibid.*, p. 9.
[22] *Ibid.*, p. 89.
[23] *Ibid.*, p. 88.
[24] Nelson, Edward M., The Huyghenian Eyepiece, *Jour. Roy. Mic. Soc.*, London, 1900, p. 162.

their plane surfaces toward the eye, placed at a distance equal to one-half the sum of their focal length. A stop or diaphragm is placed between the two lenses which is intended to converge the rays which form the image of the object and to shut off some of the dispersing rays which cause spherical and chromatic aberration. This eye piece or ocular is still in general use in the modern compound microscope.

Binocular Microscope

During the early days of the development of the telescope and the compound microscope, it seemed desirable to use both eyes for examining objects rather than one alone. Attempts were made to develop this type of instrument and the first binocular telescope was made early in the seventeenth century by a Dutch lens maker named *Lippershey* who obtained a patent for a double telescope. It consisted of two similar telescopes placed side by side just the right distance apart for two eyes. The common opera glasses are of this type. A compound microscope of similar construction was developed by Cherubin d'Orleans in 1677 and was the forerunner of the common low-power dissecting microscope of today. Since this type of microscope was available only for low power magnification, it was not very satisfactory and the idea lay dormant for over 150 years.

The discovery of stereoscopic vision and the invention of the stereoscope by Sir Charles Wheatstone, F. R. S. in 1838 gave a new impetus toward the construction of a binocular microscope which could be used for high power magnification. The first binocular microscope in which a single objective was used and the rays of light so divided that half went to the right eye and half to the left by means of four reflecting prisms was invented in America in 1851 by *J. J. Riddell* of New Orleans. Later Wenham (1860) in England invented one in which a single prism was used but neither of these instruments permitted very high power magnification. About this time another type of binocular microscope was introduced by Powell and Leland and later modified by Wenham. In his type the light from a single object is divided into two beams and so adjusted that some of the light from each portion of the beam goes to each eye, but again this did not prove satisfactory for high power magnifications so that experimentation was continued.

Tolles (1864) in America introduced a binocular stereoscopic eyepiece which could be attached to a monocular microscope and Abbe some years later also introduced a binocular eyepiece in which he used two different kinds of oculars to compensate for differences in the focusing of the rays of light.[25]

It was not until 1902 that an American, named F. E. Ives produced a binocular attachment to monocular instrument which was constructed in such a way as to be used for high and low power magnifications. This was the forerunner of the present day binocular compound microscope which is equally valuable for high and low power magnification, easily adjusted to the eyes of the observer and tilted in such a manner that he can work with ease as well as accuracy.[26]

Illumination

SUBSTAGE CONDENSERS

The necessity for concentrating the rays of light in order to illuminate objects to be examined was appreciated very early in the history of the microscope. Descartes (1637) described a method of mounting an object with a mirror so that the rays of light were concentrated on the object which could be seen more clearly by the observer. He recommended that the apparatus be enclosed in black velvet in order to shut off stray light when the orifice was applied to the eye.[27]

Since the first microscopical objects observed were opaque, it was necessary to focus the light upon them. The idea of using a lens for this purpose was conceived at a very early date. Hooke (1665) devised a method of concentrating rays of light on an object by means of a round globe of water or a very deep, clear planoconvex glass with its convex side toward the window. He also describes how the bright sunlight may be dimmed by introducing a piece of oiled paper between the object and the light or, by using a roughened bit of mirror.[28] This method of focusing the rays of light on the object by means of a lens, was used for centuries. It was modified from time to time

[25] Beck, Conrad and Jentzsch, "Binocular Microscopes Past and Present," *Jour. Roy. Mic. Soc.*, London, 1914, pp. 1-16, 17-23, 205-210.

[26] Beck, Conrad and Jentzsch, "Binocular Microscopes Past and Present," *Jour. Roy. Mic. Soc.*, London, 1914, pp. 1-16, 17-23, 205-210.

[27] Disney, A. N. Origin and Development of the Microscope, London, *Jour. Roy. Mic. Soc.*, 1928, p. 76.

[28] Hooke, Robert, *Micrographia*, London, 1665, Preface, p. 16.

and when transparent materials came to be examined, it was found necessary to place the lens below the object and thus the substage condenser came into being. After the advent of the achromatic objectives in 1824, the consequent increase of light, due to the more perfect concentration of the rays, enabled objects to be sufficiently illuminated by means of the concave mirror, so that the condenser was practically discarded.

Many of the microscopes made in England at this time were still equipped with condensers, largely because they were in the hands of a few dilettanti who wanted all the apparatus available for their instruments, even if they were not used to any great extent. The compound microscope had not become of scientific value in England as it had on the Continent where it had been introduced in the medical schools. When it came into general use for scientific purpose, it was simplified in construction and all unnecessary attachments were eliminated including the substage condenser for which the concave mirror formed a satisfactory substitute.[29] In 1880 an important change in scientific investigation occurred due to the rise of bacteriology, which necessitated the use of high power immersion lenses and the concentration of the light on a small field. In 1873 Dr. Abbe had introduced a cheap chromatic condenser, to which little attention was paid for some time, but, when the needs of bacteriologists and histologists were met by the invention of the oil immersion objective the illumination obtained from a concave mirror was not sufficient and a substage condenser became a necessity. The cheap Abbe chromatic condenser met this need exactly and was in great demand.

Several condensers for low power lenses had been devised from time to time after achromatic lenses were introduced, the first being offered by Webster in 1860 and later Abbe's which he introduced in 1873, both of which were chromatic. Later Swift (1874), Abbe (1888), and Powell (1890) introduced achromatic condensers. All of these were more or less modified from time to time but the condenser had become a necessity and the microscopist was allowed a choice as to the type or make which best met his needs.[30]

[29] Nelson, E. M., The Substage Condenser: its History, Construction and Management, *Jour. Roy. Mic. Soc.*, London, 1891, p. 90.

[30] Nelson, E. M., The Substage Condenser: its History, Construction and Management. *Jour. Roy. Mic. Soc.*, London, 1891, p. 91.

The source of light for microscopical work has had interesting developments. Sunlight and ordinary daylight were of course, practically the only sources available to the early microscopists. After oil lamps came into general use they were sometimes used for lighting the field of the microscope but were considered quite inferior to " north light " or " light from a white cloud." A description of a kerosene lamp for microscopical work occurs in one of the numbers of " The Microscope " of 1890. It is called the " Acme " lamp and its chimney was fitted with a Bull's eye at the proper focal distance from the flame and so arranged that light could be thrown on the mirror or on the object. It was devised by Mr. Pennock of the J. W. Queen Company and was highly recommended for practical use.[21] Other methods of adapting oil lamps for microscope illumination were many and varied but it was not until the tungsten electric light bulbs were invented in 1904 that a really satisfactory method of microscope illumination was available. It is to this invention that we owe the successful development of the dark field illumination and the ultra microscope.

Dark field illumination is not a new idea but was suggested by Descartes and Hooke in the 17th century. There are two methods of illuminating the microscopic field. One is to concentrate the light so that the entire field is illuminated and the object appears dark in a background of light, the other is to leave the field dark so that the objects appear as if they themselves emitted the light by which they are seen. If the objects are not self-luminous like phosphorescent animals, they are made to deflect the light from an outside source on to the field of the microscope and thus *appear* to be self-luminous. By this method very tiny objects which may be invisible in ordinary bright field microscopy are detected in the points of light which they deflect. Thus the term *ultra microscopy* has been applied to the dark field microscopy. Since there must be a *strong* light to bring about these results with very small objects, dark field illumination did not become available for the microbiologist until the electric lamps of high candle power made a bright enough light possible.[22]

[21] Notes on the Microscope Stand and its Accessories. *The Microscope*, Trenton, N. J., Vol. X, 1890, p. 87.

[22] Gage, Simon Henry, Modern Dark Field Microscopy. *Trans. Amer. Mic. Soc.*, New York., V. 39, 1920, p. 126.

Previous to its use for microscopic organisms, dark field illumination had been used for larger objects for some years by directing the light from above on the object which was placed in a non-reflecting background. Lister (1826) introduced a small cup as a well, the walls of which were painted black and Chevreul (1839) found that a *black space* gave the only non-reflecting background. Later, methods of obtaining a dark field by substage illumination were devised by using a powerful light placed at an angle so that the rays do not fall on the field but only on the object which they render self-luminous. This type of dark field illumination is described by Carpenter in "The Microscope and its Revelations," published in 1856. Other attempts to improve on this method of illumination to be used for high power and oil immersion objectives were not successful until the electric light became available.[83]

Parfocal Lenses

The introduction of the homogeneous immersion objective greatly increased the magnifying power of the microscope but it required careful focusing and adjustment in order to secure the best results. Not only was a better method of illumination needed but careful adjustments of oculars and objectives as well as delicate methods for focusing were found to be essential. The necessity of readjusting the focus each time an ocular was changed was not only difficult and tedious but often affected the results. In 1881 Edward Pennock sought to overcome this by developing a parfocal ocular.[84] He wrote to Dr. Abbe for advice and received definite specifications for the construction of such an ocular. Mr. Pennock carried out Abbe's instructions and in 1886 the James W. Queen Company with which he was connected announced that they were prepared to furnish this type of ocular. They called it "Par focal," which means equal focus (from the Latin "par," equal and focus). These oculars were soon manufactured by other optical companies and became one of the universal necessities for microscopic equipment. Parfocal objectives were the natural development from these oculars so that one could

[83] *Ibid.* Above citation.

[84] Pennock, Edw., Parfocal Objectives and Oculars. *Mic. Bul. and Sc. News.*, Vol. III, 1886, pp. 9-10.

change from one objective to another with but minor adjustments in focus.

The microscope stand also became simplified with the improvement of the fine and coarse adjustments, the mechanical stage and the abolishment of the draw tube. Binocular microscopes ceased to be the heavy clumsy instruments which they originally were but were easily adjusted, tilted at such an angle that the observer could work with ease and comfort and they could be changed to monoculars with little difficulty.

Summary

In an address before the Royal Microscopical Society of England in 1878, Mr. Frank Crisp [55] took occasion to deplore the lack of interest which his countrymen evidenced in seeking to improve the microscope. He pointed out that there was a certain apathy regarding the important researches of Professor Abbe which could only be explained by the fact that the study of the uses of the microscope in the Natural Sciences had dulled all interest in improving the instrument itself. In this rather scathing denunciation he charges that, "a more or less definite belief has grown up that we have arrived at a state of perfection or at the limits of the possible, as far as the compound microscope is concerned." This assumption, Mr. Crisp points out, has no foundation in fact. There have been other scientists who have held this same idea concerning the microscope during the past.

"It is both amusing and instructive," says Mr. Crisp, "to take books written at different periods of the present century and note how each writer in his turn expresses the conviction that at last perfection has been reached." He quotes Dr. Goring who wrote in 1829, referring to the first achromatic objectives, that "microscopes are now placed completely on a level with telescopes and like them must remain stationary," and Sir D. Brewster, who later wrote, "The ingenuity of philosophers and artists has been nearly exhausted in devising the best form of object-glasses and eyeglasses for the compound microscope." Now in 1878 Mr. Crisp feels that the above

[55] Crisp, Frank, On the present condition of Microscopy in England. *Jour. Roy. Mic. Soc.*, London, 1878, p. 121.

sentiments have again become somewhat universal and that some incentive is necessary to stimulate ideas for improving the microscope.

This incentive was supplied a little later by Professor Abbe who invented the apochromatic lens, Pennock who constructed the parfocal ocular and Ives who introduced the new binocular attachment suitable for high power work. During the present century improved methods of illumination have increased the magnifying powers of the microscope far beyond any of those dreamed of by Crisp and his associates. Application of improvements in the science of photography to the microscope have made possible the detection of objects hitherto invisible to the eye of the observer and now (1940) the Electron Microscope is announced.[86]

This new invention which was demonstrated for the first time by the Radio Corporation of America in April 1940 at their New York laboratories, has little resemblance to the ordinary microscope. It used electrons instead of light, and their wave length is 1/100,000 times smaller than that of visible light. It makes visible in sharp outlines such minute materials as filterable viruses, too small to be seen by the 2,500 diameters of the ordinary microscope, and will thus reveal many of the secrets hitherto concealed from the human eye, even when supplemented by the modern ultra microscope. Small wonder Mr. Crisp waxed indignant at the idea that the instrument had reached perfection in 1878!

[86] O'Neil, John J., The Electron Microscope has its Debut. *New York Herald Tribune*, April 20, 1940.

A HISTORY OF HYPERTROPHIC PYLORIC STENOSIS AND ITS TREATMENT *

HAROLD C. MACK

PART II

HISTORY OF TREATMENT

Like the theories of its pathogenesis, the methods of treatment suggested for pyloric stenosis are many. These followed, in the main, two distinct lines (a) Medical methods; (b) Surgical methods.

A. *Medical Treatment*

Medical methods of treatment owe their development largely to the "spasm first" theory of the disease, just as surgical methods resulted from the recognition of the associated muscular hypertrophy. Attempts at a causal or curative therapy by medical means attempted to overcome spasm by the following methods: 1. Gastric lavage. 2. Anti-spasmotic drugs. 3. Dietary measures. 4. Local applications, and other non-surgical methods.

(1) *Gastric lavage*, popularized by Kussmaul (1869) for the treatment of gastric hypertrophy resulting from pyloric obstruction in the adult (cicatricial ulcer, neoplasm) became the first standard treatment for pyloric stenosis in infants.[5] Epstein (1880) was the first to recommend its use in gastric dilatation of infants. A. Hess (1913) practiced duodenal catheterization, but gained few adherents because of non-patency of the pylorus to the catheter. According to Berend, Pfaundler advised this procedure in 1906, though there is no record of his having accomplished it.

* See this *Bulletin*, 1942, Vol. XII, pp. 465-485.

[5] While Kussmaul is commonly credited with the invention of the stomach pump and the practice of gastric lavage generally, Friedenwald and others have pointed out that in this he had many predecessors. Philip Syng Physick of Philadelphia appears to have been the first to employ the stomach tube in infants. His publication (1812) states that he performed gastric lavage on three months old twins who had received an overdose of laudanum. Dorsey, his nephew, in 1809 published a similar account but gives credit to his uncle for priority in the use of this procedure which Physick claimed to have practiced since 1800.

The rationale of gastric lavage, according to Kussmaul, was that pyloric constriction was brought about (in the adult) through excessive sympathetic nerve stimulation by the acid contents of the stomach. He cited an instance in which daily emptying of the stomach, followed by lavage with a solution of sodium bicarbonate, resulted in a cure. In long standing cases of advanced or complete pyloric stricture he admitted failure. "It may be," he wrote prophetically, "that the keener intellects of future generations will undertake, in such case, to resort to gastrostomy, fistula, enlargement of the pyloric opening by means of a knife or tube, in order to obtain radical results. Who would dare to answer this question today? I fear that even this suggestion may elicit secret or open ridicule"[6] (Bast).

Many adherents of the "spasm first" theory were strong advocates of gastric lavage, on the assumption that gastric acidity in infants contributed to pyloric spasm and stenosis. Pfaundler recommended this practice on the ground that lavage caused gastroparesis and pyloric sphincter relaxation so that air could pass through the otherwise impermeable pylorus. This practice was debated vigorously at the Pediatric Congress in Cologne (1908). Heubner and Feer were strong in their disapproval. Berend (1910) also found it of no value. Fredet (1910) considered lavage useful only for overcoming stasis and for diagnostic purposes. He warned against prolonged use in severe cases, stating that deaths, resulting from aggravation of the existing asthenia, could be attributed to this procedure. Henschel (1891) reported an instance of resorcin intoxication following gastric lavage with this agent.

2. *Antispasmotic drugs* employed were legion: *Tinct. valerian, potassium bromide, antipyrine, opium, cocaine, novocain, belladonna* (Schmielinsky, Finkelstein, Weill, Hutinel) and *atropine* (von Strümpel, 1904).

The "atropin treatment of pylorospasm and pyloric stenosis," popularized in 1918 by Haas, was an important revival with modifications of an older practice. The good results obtained by Haas and

[6] The first attempt to excise the pylorus was made by Pean in 1878; Wölfler's gastroenterostomy, to circumvent the pylorus, was performed in 1881. Note also that hypertrophic pyloric stenosis of adults (congenital) was being recognized at this time (Landerer, 1879; Meier, 1885).

SIDNEY V. HAAS
1870-

his followers were cited as further proof of "spasm first"—"that the etiology of the disease is one which makes it a medical problem, and that we possess in atropin a drug which may be properly termed a specific in its curative action. I hold as my thesis that so-called hypertrophic pyloric stenosis is merely an advanced degree of pylorospasm, and is only a single manifestation of a general state whose etiologic factor is an overaction of the vagus portion of the autonomic nervous system, and usually a hyperexcitability of all motor functions" (Haas, 1922). Haas reported cures of both pylorospasm and true stenosis. In his most recent publication (1941) Haas decries the "unjustified tendency to resort to surgery." He admits, however, that surgical intervention is occasionally justified, though never until medical measures (atropine sulphate, calcium, phenobarbital, thick gruel feedings, parenteral fluids) have failed. Fredet (1910) expressed a strong preference for belladonna over opium and pointed out that the dosage of the former must be increased during treatment because of acquired tolerance. Haas (1941) also speaks of "atropin fixation."

Drugs, other than atropine, have enjoyed for the most part only passing popularity. Calomel and the various alkalies (sodium bicarbonate, magnesium carbonate, sodium citrate, lime water) and others have had their advocates. Fredet (1910) warned against the dangers of excessive alkalinization.

3. *Dietary measures.* Prescribed dietary methods were many and varied: iced milk (Ibrahim), frequent small feedings (Ibrahim), normal feedings at usual intervals (Heubner), infrequent small feedings (Ibrahim), re-feeding after vomiting, breast milk, no breast milk, skimmed milk (Tobler), whole milk, and concentrated milk.

The thick "farina" feedings advocated by Sauer (1918) and still employed today were a revival (with scientific improvements) of an old practice mentioned by Hildanus (1627). Sauer's method was inspired by Hahn (1911) and McClure (1914) who found heavy foods of value in the treatment of idiopathic and neurotic vomiting of infants. Nicoll (1910) had also described a "paste"; "The five patients mentioned above were all fed on a form of very thin paste made by mixing, with milk, flour which had been baked by the nurses; and our surgical sister, Sister Laura Smith, tells me that the

Louis W. Sauer
1885–

duration of the baking process is regulated according to the age of the infant for which the food is intended. For a good many years our working rule has been that if the baked flour food fails, operation should be resorted to."

Various explanations were advanced to explain the efficacy of heavy gruel feedings: (1) that the hypertrophied stomach with its vigorous peristaltic action could better force a thick food through the pylorus (Sauer); (2) that the thick food was more readily retained and hence less easily ejected; (3) that the high starch content acted as a protective colloid, thus preventing the formation of hard casein curds (Mixsell) and, (4) that these colloids protect the irritated pyloric mucosa.

The benefits of Sauer's method were demonstrated to the satisfaction of many. Like the atropine treatment, this *regimen*, even if not universally efficacious, serves as a valuable therapeutic test to differentiate between pylorospasm or mild obstruction and complete stenosis. This opinion was expressed by Levy (1922), an early advocate of the Sauer method: "Which cases, then, become surgical? In a word, those which fail to yield to medical handling. Certainly no gross generalization is permissible. . . . If in spite of the correct application of the measures to be described the vomiting is not arrested, and the infant loses further in weight and strength, the surgeon is forthwith to be consulted."

Modifications of the Sauer method were advocated by Porter, Finkelstein, and others, though Finkelstein pointed out, "the composition is of less moment than the consistency" (Sauer).

4. *Local applications and other non-surgical methods.* Local applications of heat to the epigastrium in the form of hot compresses, various types of cataplasms, and the thermophore were frequently employed in pyloric stenosis as in other abdominal conditions of childhood. Hildanus claimed his cure largely by such means.

Irradiation of the thymus, based on Palmer's theory (later repudiated) that thymic enlargement may be related to pyloric stenosis, has found no adherents. Lange of Cincinnati, according to Pfahler, was the first to attempt this method of treatment. Wiener (1929) claimed benefits from x-ray irradiation of the pylorus itself. This method also lacks confirmation. Romano and McFetridge (1938) state:

"Aside from the fact that valuable time may thus be lost, it is obvious that a dose sufficiently large to affect the tumor is likely to have disastrous effects on adjacent structures."

Stretching of the pylorus by means of a catheter strung on wires or thread (as carried out by Grulee in oesophageal stricture), or as attempted by Einhorn in pyloric stricture in the adult, has been suggested, though, so far as is known, never attempted (Vreeland).

5. *Adjuvant methods.* Procedures to combat starvation and dehydration (nutrient enemas, parenteral fluid) were commonly employed when pyloric stenosis was first recognized. Without their sustaining effects, many infants would have succumbed despite other methods of therapy. Nutrient enemas, dating back to the time of Celsus (according to Friedenwald and Morrison) were used in the 17th century (case of Hildanus). Schwyzer (1896) kept an infant alive for a fortnight by rectal instillations alone. Batten (1899) advised feeding through a nasal catheter. Fuhrmann (1907) employed breast milk in rectal feeding. Sutherland (1907) suggested saline and Rosenstern (1910) Ringer's solution in proctoclysis.

Parenteral methods of administering fluids owe their development to the invention of the hypodermic needle and syringe by Francis Rynd (1841). The use of hypodermoclysis is mentioned by most writers since the time of Hirschsprung.

B. *Surgical Treatment*

Despite energetic applications of all methods of medical therapy, it soon became obvious that true hypertrophic stenosis of an advanced degree could not be cured by medical means. The struggle to determine criteria for the abandonment of medical treatment and the institution of heroic surgical efforts precipitated many bitter debates. For the most part these discussions were continuations of the old argument concerning the pathology of pyloric stenosis, namely spasm versus hypertrophy. Those who believed in essential pylorospasm were largely strong adherents of strictly medical management; those who favored the surgical approach also favored the concept of primary hypertrophy. Since the care of most infants fell to the lot of non-surgeons, it is obvious that the surgeon was called upon, if at

all, only when dire emergency required a desperate effort. There were some, indeed, who absolutely rejected surgery as unnecessary. Others (Feer) reluctantly conceded failure of medical measures only when one-third of the body weight had been lost, on the basis of Quest's statement that life was incompatible with a weight loss of more than 34.8 percent. Czerny suggested that decision for surgery should be made before this figure is reached. (Berend's child lost 42 percent and survived.) Their apparent obstinacy can be understood when, as Ibrahim pointed out, forty-two surgical attempts made between 1897 and 1904 netted a mortality of 50 percent, a death rate which was higher than that reported for medical management. The fact that these surgical attempts were made upon infants largely *in extremis* did not dissuade ardent proponents of medical management from their stand. Voelcker (1907) summed up the dispute with the question: "Should the child be saved by surgery or from surgery?"

Schwyzer of New York (1896) is commonly, though erroneously, credited with being the first to recommend the surgical treatment of infantile pyloric stenosis. His widely read paper was published three years after the first attempt had already been made by Cordua (1893). Schwyzer's priority consists in being the first to recommend divulsion of the pylorus (Loreta operation) or gastroenterostomy, procedures which produced the first surgical cures on record in the literature.

First Surgical Attempts

1. *Jejunostomy* was the first surgical procedure to be employed in hypertrophic pyloric stenosis of infants. This attempt (1892) by Cordua, of Hamburg, was unsuccessful. The greatly emaciated child succumbed a few hours after operation despite immediate feeding, presumably of shock and exhaustion. Grisson, who assisted at the operation, states that the jejunostomy was intended only as a palliative measure to prepare the child for eventual pylorectomy. The disproportion manifest between the greatly enlarged stomach and the delicate and collapsed intestines caused Cordua to consider gastroenterostomy as impossible of performance. In the light of subsequent developments, this bold attempt at a radical procedure (pylorectomy) in a child in poor condition was unfortunate—*une péche de jeunesse* (Fredet). No similar attempts are recorded, although Brauer

(1903) defended its use as a palliative procedure when subsequent gastroenterostomy was contemplated. A jejunostomy performed by Taylor in 1909, after pyloroplasty, also resulted fatally. Fredet (1910) pointed out that this procedure neither affects the primary lesion nor combats the gastric stasis. Winternitz (1910) stated that children with intestinal fistulas die quickly—" This can be stated as a maxim."

2. *Gastroenterostomy.* The first two attempts to apply this operation in pyloric stenosis of infants also failed. The first by Carl Stern of Düsseldorf (June 3, 1897), resulted in death from collapse a few hours after operation, although postmortem examination showed the stoma open and the wound closed securely. The greatly emaciated child became apneic at the onset of the operation. The second gastroenterostomy, by Willey Meyer of New York (January 23, 1898), was performed by means of the Murphy Button. Meltzer, who reported this attempt, wrote: " The button was too large for the exceedingly narrow jejunum, and not only prevented the stomach from emptying its contents into the intestines, but also caused stagnation of the bile in the parts of the duodenum and jejunum lying between the pylorus and the place of the anastomosis with the stomach." Although Meltzer stated that smaller buttons were prepared for use in subsequent cases, no other attempts to use the Murphy Button technique have been recorded. Meyer's second trial of gastroenterostomy (this time by suture), was equally unsuccessful (Case of Adler, published by Meltzer). " It seems to me, therefore," wrote Meltzer, " that the typical pylorectomy (Billroth) is the ideal operation for the relief of hypertrophic pyloric stenosis in infants."

Löbker of Bochum performed the first successful operation for hypertrophic pyloric stenosis July 25, 1898. His operation was a posterior gastroenterostomy (von Hacker technique). The infant of ten weeks made an excellent recovery. His second operation failed. Based on this experience of two attempts with only one success, he stated dogmatically that gastroenterostomy is the only procedure which could possibly succeed in this condition. He gives an interesting account of his post-operative management: " Such children should be handled as are the prematurely born. I admit the mother to the hospital with the child. Even during the operation the mother

must lie in bed with the lower part of her body uncovered and her knees drawn up so that her lap provides an artifical brooder. The child is kept there for the next few days and is not removed even for feeding." [7]

Two additional successes with gastroenterostomy were obtained by Kehr within two years following Löbker's initial success. Before 1900 seven attempts were made with only three survivals.

3. *Divulsion of Pylorus* (Loreta's operation) (Nicoll-Loreta operation). No direct attack upon the site of the disease, the pylorus, was made until 1899. At this time, James Nicoll of Glasgow applied to pyloric stenosis of infants a surgical procedure first employed by Loreta of Bologna (1887) in the adult. Schwyzer (1896), as stated above, had previously recommended this procedure. Loreta's operation consisted of digital dilatation or divulsion of the pylorus through a gastrostomy wound. Nicoll applied this technic in July 1899. He wrote:

> The pylorus was found represented by a bulky ring of muscular (or fibromyomatous?) tissue. In the child's wasted and enfeebled condition a pylorectomy appeared hopeless. I therefore carried out an operation which was practically a Loreta's.
>
> I opened the stomach by the incision, passed in a pair of dressing forceps, forced this with a screwing motion down through the constriction into the free intestine below, and then expanded its blades till the peritoneal coats ruptured, thus widely dilating the thickened and practically completely stenosed pylorus. Suture of the stomach wall, followed by suture of the parietes, completed the operation.
>
> The infant made a perfect recovery from the operation, the effect of which was complete relief of the previous obstruction. . . . Whether the relief obtained by the operation is to prove permanent remains to be seen. The operation was intended as a temporary measure adopted in face of the extreme debility of the infant.

[7] The importance of proper nursing care in the post-operative period has constantly been stressed. Nicoll (1910) wrote that proper care requires "a nurse who knows something of the care of infants and who is prepared to nurse the child 'maternally' as well as 'surgically.'. . . If kept flat in bed, and allowed to cry, these feeble infants exhaust themselves or have to be quieted by collapsing and sickening sedatives. If nursed in the arms they often sleep quietly and conserve their strength." Similarly, Rutherford (1935) urged the utopian scheme of relays of nurses delegated to hold the child in their arms and thus insure constant body warmth. He also recommended early discharge from hospital to home care.

JAMES H. NICOLL
1864–1921

The case would appear to be probably the first successful case of operation for this affection.

In 1904 Nicoll wrote " from an experience of fifteen cases " reporting nine operations with three deaths: " The child in whose case I operated in 1899 remains in good health, having had no relapse of the symptoms." He added: "And I still hold that the appropriate treatment of ' hypertrophic stenosis of the pylorus ' is to ' burst up ' the thickened pyloric ring by forcible overstretching from within, as one does an obstinate urethral stricture." Apparently not entirely confident of the efficacy of his operation, he recommended: " if the condition of the child permit, complete the operation by a gastroenterostomy making use of the incision already in the stomach wall." " If collapse is imminent," he cautioned, " close the stomach and abdomen rapidly by suture, regarding the operation as a temporary measure merely, as I did in my first case."

Nicoll's success with the Loreta operation stimulated other trials, not, however, with universal satisfaction. As in several of his own cases no relief, or only temporary relief, from the obstructions was reported (Mackay, Stiles, Stabb). Burghard (1907) appears to have been his most ardent follower, reporting sixteen attempts with only five deaths. Fredet (1910) suggested that the high percentage of cures claimed by Burghard indicate that a large number of his cases may have had simple pylorospasm. The fact that Nicoll himself advised additional gastroenterostomy and that practically no new case reports of this procedure were published after 1907, caused Fredet (1910) to comment that such " ostracism is not based merely on theoretical consideration, but rather on facts." While the operation possessed the merits of speed and simplicity, it was both brutal and blind; the pylorus was not merely stretched but rather torn, giving rise to risks of hemorrhage, perforation, and subsequent cicatricial stricture. Bloch (1907) wrote of a case: "Although the dilation was performed with the utmost gentleness, the autopsy revealed the main portion of the pyloric musculature had been torn." Berend and Winternitz (1910) reported failure of the Loreta operation performed in 1905 upon Berend's own child.

4. *Pylorectomy.* On Meltzer's recommendation, quoted above (1898), Harold Stiles of London, attempted a pylorectomy in March

W. H. v. Heineke
1834–1901

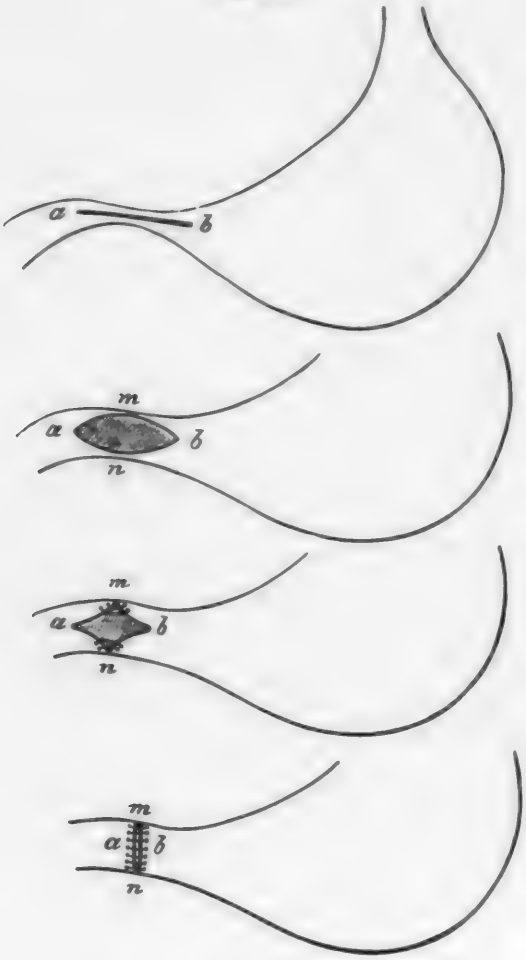
1900. The infant of eight weeks died of collapse in eight hours. No other attempts at complete pylorectomy have been recorded. A partial pylorectomy or resection was performed successfully (1908) by B. Farquar Curtis, although a secondary operation was necessitated four days later to counteract obstructive symptoms due to redundancy of the mucosa.

5. *Pyloroplasty* (Heineke-Mikulicz). This method of attack upon pyloric stenosis was introduced by Clinton Dent (1902), a London surgeon using the technic described independently by Walter von Heineke (1886) and Johann von Mikulicz-Radecki (1887) for the relief of pyloric strictures in the adult. The accompanying illustration from Mikulicz' report illustrates the principle of the method (Heineke's earlier publication contains no illustrations; it is included in an inaugural dissertation by Fronmüller). The operation consisted of converting a longitudinal incision extending through the serosa, muscularis, and mucosa of the pylorus into a transverse one by suturing the resulting wound in the opposite direction. The first attempt to apply this method to the infant, made by Braun on October 17, 1900, was reported by Lange in 1901. This attempt resulted fatally twenty hours after operation, though postmortem examination showed the pylorus to be patent and the incision closed. The very much emaciated child was too debilitated to withstand the surgical shock.

The first successful applications of this method in infants were made by Dent, June 10 and August 19, 1902. The first child apparently recovered completely from the operation only to die three months later of "zymotic enteritis." The second child, a physician's son, was cured despite the complication of a spill of gastric contents during the operation. Dent described his technique as follows: "The incision should divide freely the thickened tissues and extend well into normal structure on each side. An inch is rather a short incision. Even in a very young child no difficulty will be found in uniting the wound transversely with an incision fully an inch and a half in length. . . . No difficulty was found in either case in bringing the serous wound together in a perfectly satisfactory manner, i. e., the parts where the thickening and the toughness of the tissues were greatest were almost as easily sewn together as the central normal parts of the

JOHANN VON MIKULICZ-RADECKI
1850–1905

Fig. 1—4.



From: *Arch. f. Klin. Chir.* 37: 79. 1887

CLINTON THOMAS DENT
1850–1912

Fig. 3.—VY. Pyloroplasty: first stage. The V incision traverses the peritoneum and hypertrophied muscular coat only.

Fig. 4. VY. Pyloroplasty: second stage. The V incision converted into a Y-shaped wound by internal division and external traction, and the sutures placed in position. The intact mucous coat is shown below the sutures.

Fig. 5.—VY. Pyloroplasty: third stage.

From: *The Practitioner*. 85: 659, 1910

wound. The objection that has been taken to the operation on this ground, therefore, seems to us to be entirely disproved by practical experience."

Berend and Winternitz in 1910 describe the case of Berend's own child, an infant of three weeks in extremely poor condition, on whom Winternitz had performed a Loreta operation without success (October 21, 1905). One week later, a Heineke-Mikulicz pyloroplasty was performed. This operation was carried out after introducing a No. 7 Nelaton Catheter into the stomach through the mouth, from whence it was pushed through the pylorus into the duodenum. The pyloroplasty was performed with the catheter in place. Winternitz wrote: "I opened the mucosa of pylorus and duodenum, i. e., I carried the incision into the lumen which I believe was unneccessary since in this instance there is no problem of mucosal stricture. I am convinced that severing the muscle layer alone (extramucosal pyloroplasty of Mikulicz) would serve the purpose. . . . The catheter remained *in situ* thirty-six hours after operation and nourishment was administered through it." Berend and Winternitz were the first (and only) to employ catheter feeding in conjunction with pyloroplasty and considered it as an important procedure in very emaciated infants. They attributed their good result in this case in large part to this measure.

While Dent was particularly successful in his attempts, recording ten additional cases within the next five years with only two deaths, other surgeons were not so fortunate. A total of twenty-six operations of this type performed between 1900-1907 resulted in only fifteen cures (57.6%). Opinion finally united in condemning the operation on the grounds of (1) frequency of peritonitis resulting from the spill of stomach contents on opening the mucosa, (2) further pyloric obstruction caused by crumpling of the redundant mucosal folds, and (3) inability to unite the cut edges of the thickened pylorus. The latter objection was so commonly voiced that surgeons generally agreed that pyloroplasty was not so much an unsuitable as an impracticable method (Monnier, Robson and Moynihan, Weill and Pehu, and others). Dent stanchly defended his operation especially against the proponents of gastroenterostomy ("a palliative makeshift"). He also spoke out sharply against "submucous pyloro-

plasty": "There seems to be no advantage in performing what has been termed 'submucous pyloroplasty.' If there were any distention of the stomach this would be an embarrassing proceeding. It is better to divide all the coats." *This statement made December 9, 1902 indicates that someone had already proposed this modification of the Heineke-Mikulicz operation for the relief of infantile hypertrophic pyloric stenosis.* While no name is given in this discussion to indicate the identity of the person who proposed this modification, Dent may have referred to Nicoll who, four years later, published his results with the first modification of total pylorotomy (Heineke-Mikulicz pyloroplasty).[8]

5. *V-Y Pyloroplasty.* This "submucous" method of *partial*, as opposed to the *total* Heineke-Mikulicz pyloroplasty, was another innovation of James Nicoll. It was introduced in 1906 as the "V-Y Method." *This technic was the direct forerunner of the modern surgical treatment.* It consisted of a V-shaped incision over the pylorus which was carried down to, but not through, the mucosa. The V-shaped incision was converted into a Y-shape in closure. At the meeting of the Glasgow Medico-Chirurgical Society, December 15, 1905, Nicoll first described this operation, reporting six cases treated with one death from shock. He said: "The operation performed in all six consists in an application of the well-known V-Y method, so widely used in plastic surgery in general. . . . The V incision in four of the cases penetrated the muscular coat only and was closed (as a Y incision) by the single row of sutures shown. If this 'submucous' plastic operation be adopted, it is necessary to combine with it divulsion, by means of a pair of forceps passed through the incision indicated in the gastric wall. In the two remaining cases the V incision was carried through into the lumen of the

[8] In 1904 (*Brit. Med. Jour.* 2: 1148, 1904) Nicoll wrote: "It has been suggested that pyloroplasty may prove a suitable operation. While without experience of this measure in an actual case, I have experimentally tested its performance post-mortem, in the stomach of an infant affected by the disease, and believe that the thickness of the pyloric wall renders pyloroplasty unsuitable in this instance." No mention is made of the "submucous" method in this communication. According to Fredet (1910) Mikulicz performed partial (i. e., submucous) pyloroplasty five years after Jaboulay of Lyon had described a similar operation in the adult (1893). Kausch (1910) warned of danger of obstruction caused by mucosal folding after partial or submucous pyloroplasty.

pyloric passage, and was closed (as a Y incision) by the customary two rows of the Czerny-Lembert suture."

In adding the Loreta procedure to his submucous pyloroplasty Nicoll remained faithful to his first love. In so doing, however, he deprived himself of general recognition as the forerunner of the modern surgical approach. The pyloroplasty, as he himself described it, had already overcome the obstruction, hence the Loreta operation, as Fredet put it, was "more a verification than an operation." In this operation Nicoll appears to have had no followers. Indeed, he himself does not seem to have had complete confidence in its efficacy. In 1910 he wrote: "As to the operation of choice, the last word has probably yet to be said. As far as cure of the stenosis and dilatation is concerned, undoubtedly the best procedure is a combination of either pyloroplasty (V-Y method) or divulsion with posterior gastro-enterostomy."

(*To be continued*)

NOTES AND COMMENTS

MEDICAL HISTORY COLLECTIONS IN THE UNITED STATES AND CANADA *

VII

THE WILLIAM N. BRADLEY COLLECTION IN THE LIBRARY OF THE COLLEGE OF PHYSICIANS OF PHILADELPHIA:

An Iconography of Philadelphia Physicians as They are Represented in Works of Art

W. B. McDANIEL, 2d

In October, 1941, Dr. William N. Bradley, a member of the Library Committee of the College of Physicians of Philadelphia, presented to the library the fine fruits of a hobby that had occupied his spare time for a number of years. These are primarily 2,789 uniform-size photographs mostly of works of art dealing with Philadelphia medicine and its practitioners. The photographs are contained in twelve beautifully bound volumes and are accompanied by a typewritten historical and biographical commentary. A thirteenth volume contains silhouettes of contemporary Philadelphia physicians. There are, further, two index-volumes. The specially designed case in which the volumes are housed contains also the films from which the photographs were made, a card index of artists and another giving brief biographical data, with source references, of the subjects.

Dr. Bradley used a broad scale of reference in the concept and in the carrying out of his project. Thus, the first volume, introduced by a frontispiece depicting the ships associated with our early history, gives a brief historical sketch of the settlement of the Delaware River, illustrated by representations of the interested European rulers, explorers, and settlers; passes on to the barber-surgeons, the coming of William Penn, and, finally, the earliest Philadelphia physicians.

* See this *Bulletin*, 1939, Vol. 7, pp. 535-563; 1940, Vol. 8, pp. 1214-1245; 1941, Vol. 9, pp. 332-336, pp. 545-579; 1942, Vol. 11, pp. 87-89.

Thomas Graeme and Cadwalader Colden appear to be the earliest of whom likenesses were found; John Goodson, Nicholas More, and Thomas Wynne, of an earlier generation, are represented by reproductions of their autographs. The aquiline features of John Redman, first president of the College of Physicians, appear in 13 photographs and his bookplate in one.

It should be more widely known than it is likely to be, that Dr. Bradley's second volume is an extraordinary achievement in itself, bringing together, as it does, 238 photographs recalling the appearance and activities of Benjamin Franklin.

The third volume is devoted to picturing and describing institutions in Philadelphia in which instruction has been given in medicine and science.

Volumes 4 to 12, inclusive, comprise the iconography proper. Though the great majority of the photographs reproduce the features of physicians as they are portrayed in a variety of art media (but excepting the modern photograph), Dr. Bradley has here again occasionally drawn upon items of association. We find, for example, some 56 reproductions of likenesses of Benjamin Rush—but also photographs of his watch and shoe-buckle, both in the possession of the College. John Morgan is recalled by a reproduction of the title-page of his "Discourse Upon the Institution of Medical Schools in America" (1765), as well as by photographs of contemporary representations of his person; there is even one of an artist who has left us a painting of him, Angelica Kauffmann, whose attractive portrait of Morgan, painted in Rome in 1764, has often been reproduced.

The two-volume index gives the number of each photograph, the subject, the original medium, the name of the artist, the year in which the original was made, the owner's name, the source of the photograph, and the volume and page numbers of the volume in which it may be found. The collection contains, in addition to the other indexes, a card-index of early physicians of whom no image has been found, and a loose-leaf volume in which is recorded the use made of the collection; it may be added that the collection has already proved its usefulness as a source of rare—in some cases, unique—illustrative material.

"Many errors were found in literature where these works have been reproduced," Dr. Bradley has written in his *Preface,* "and verification has necessitated considerable research. Cooperation of possessors of the originals has not at times been all that could be desired. . . . The work as here presented, is not to be considered in the light of a complete collection. This would obviously be an impossible task; it is however as complete as it has been possible to make it. It will, I hope, serve as a nucleus, to which will be added from time to time, those which 'come to life' and those which each succeeding year will contribute."

The collection is dedicated to Dr. Samuel Creadick (1840-1898): "A paternal uncle, sincere friend, delightful personality, Christian gentleman, staunch citizen, and capable physician, beloved by all."

Only one who has witnessed Dr. Bradley in pursuit of a generally unknown and prizable work of art, owned perhaps by some conservative and suspicious descendant of its subject, and seen him emerge triumphantly, often after years of effort, with a small photograph in his hand; only one who has followed his searches of the literature, his examination of old records in one institution after another—only such a one perhaps would fully comprehend what a labor of love this collection represents. No one who turns the pages of these volumes, however, can fail to have some realization of the labor expended upon them, or to succumb to the cumulative effect of this fascinating pictorial record of Philadelphia medicine. But its chief value, obviously, is that for many years to come it will serve as a treasure house of illustrative material for historical writers who have a just respect for the animating power of the 'speaking likeness' and for the mute eloquence of the personal memorabilia which we call items of association-interest.

MEDICO-HISTORICAL NEWS AND ACTIVITIES

AMERICAN ASSOCIATION OF THE HISTORY OF MEDICINE

The Association regrets to announce the death of Dr. Walter R. Steiner at Hartford, Connecticut on November 4, 1942. Dr. Steiner always took an active part in the Association and was its President from 1938 to 1939. An obituary with a bibliography of his historical writings will be published in some later issue of the Bulletin.

CONSTITUENT SOCIETIES

The Johns Hopkins Medical History Club, Baltimore, Md.

The Club held its first meeting of the year on Monday, November 2, 1942 in the Lecture Hall of the Institute of the History of Medicine, The Johns Hopkins University. Dr. Joseph Gillman from the University of the Witwatersrand, Johannesburg, South Africa, discussed *Early Medicine in South Africa under the Dutch East India Company, 1652-1795.* The following new officers were elected:

President:	Dr. George W. Corner
Vice-President:	Dr. Alan M. Chesney
Secretary:	Dr. Henry E. Sigerist
Delegate to the A. A. H. M.:	Dr. Owsei Temkin

The New York Society for Medical History

The November meeting of the Society was held at the New York Academy of Medicine on November 5, 1942. The speaker of the evening was Dr. Gregory Zilboorg who presented a paper on *Russian Psychiatry: Its Historical and Ideological Background.* The paper was discussed by Dr. Mark Slonim and Dr. Rudolph Loewenstein.

The Society of Medical History of Chicago

A joint meeting of the Society and the Institute of Medicine of Chicago will be addressed on November 27, 1942 by Professor Richard H. Shryock who will speak on *Factors Affecting Medical Research in the United States, 1800-1900.*

NATIONAL NEWS

Boston, Massachusetts

On October 23, 1942 Mr. James F. Ballard, Director of the Boston Medical Library, completed fifty years of service to that institution. In recognition

of his long years of unselfish and skilled services, the Trustees of the Library have proposed the immediate accumulation of a fund to be known as the James F. Ballard Publication Fund. The first publication, now in press, will be *A Catalogue of Mediaeval and Renaissance Manuscripts and Incunabula in the Boston Medical Library*, compiled by Mr. Ballard under the direction of the librarian, Dr. Henry R. Viets. As one of his chief interests has been fifteenth century books, this first publication seems very appropriate.

New Haven, Connecticut

The *Historical Library of Yale University School of Medicine* has issued its second Annual Report which gives a vivid picture of its manifold activities.

San Francisco, Calif.

A Library for Research on the Medical Uses of Wine at the University of California Medical School.

At the present time a project on the History of the Medical Uses of Wine and Alcoholic Beverages is being undertaken by members of the Division of Preventive Medicine at the University of California Medical School. A special and permanent library with research facilities is being established. In addition there is developing a bibliographic index, an index of notes and letters of historical interest and a reprint and abstract file. Aside from pamphlets and files of the Quarterly Journal of Studies on Alcohol, the library at the present time consists of more than one hundred and fifty volumes. The collection is classified as follows:

(1) Agricultural: viticulture
(2) Classical Works:
  (a) Greek and Roman Literature (in which are references to the medical use of wine)
  (b) Ancient Medical Treatises
(3) Eating and Drinking Customs
(4) Medical Treatment for Alcoholic Addiction
(5) Medical Use of Beverage Alcohol
(6) Pharmacologic Aspects of Alcoholic Beverages
(7) Reference Works:
  (a) Dictionaries and Lexicons
  (b) Technical Treatises
  (c) Historical Treatises
(8) Social Relations: Alcohol in relation to Society
(9) Wine Industry and Trade.

The bibliographic index is divided and arranged alphabetically according to *Authors*, and according to *Subjects* (the latter including a system of

cross indexing). The subject cards are grouped under five general headings: *Historical, Medical, Nutritional, Physiological,* and *Miscellaneous,* each division being identified by a different colored card. References to books regardless of the subject are distinguished by cards of a specific color. Under *Miscellaneous* are classified subjects which, though related to, are not specifically a part of, the other four divisions. All general headings are broken down into smaller groups and these in turn into subheads.

Reprints and abstracts are filed in letter-size drawers and are classified under the same general subject headings as the cards of the index. Colors in the letter-size file correspond to those in the bibliographic index, thus facilitating reference from the card file to the reprint and abstract file. The indexes are available to all research workers who are interested in any phase of the subject.

S. P. Lucia, M. D.